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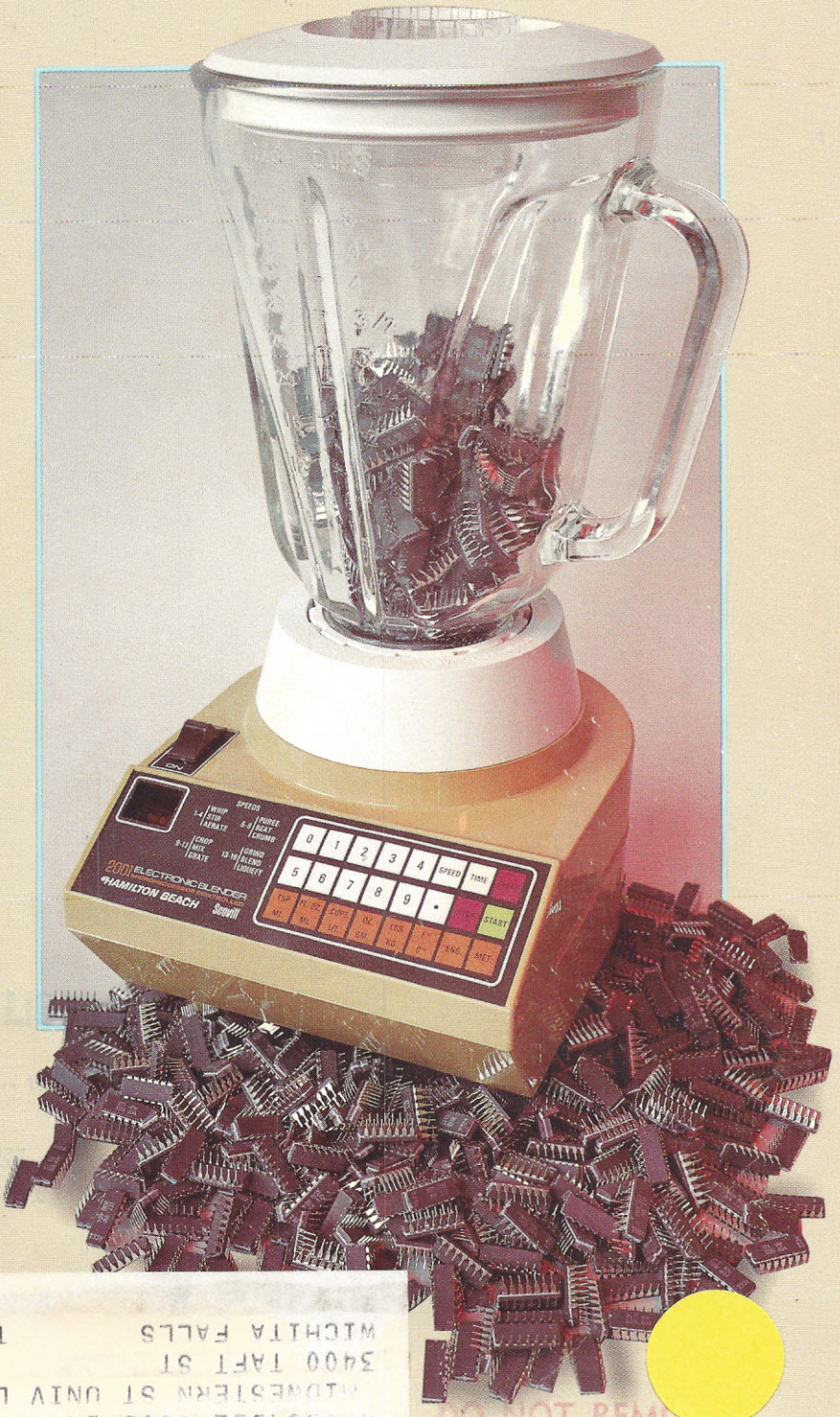
A NEW TUTORIAL
Using and Building a Micro System

EDITORIAL INDEX for 1979



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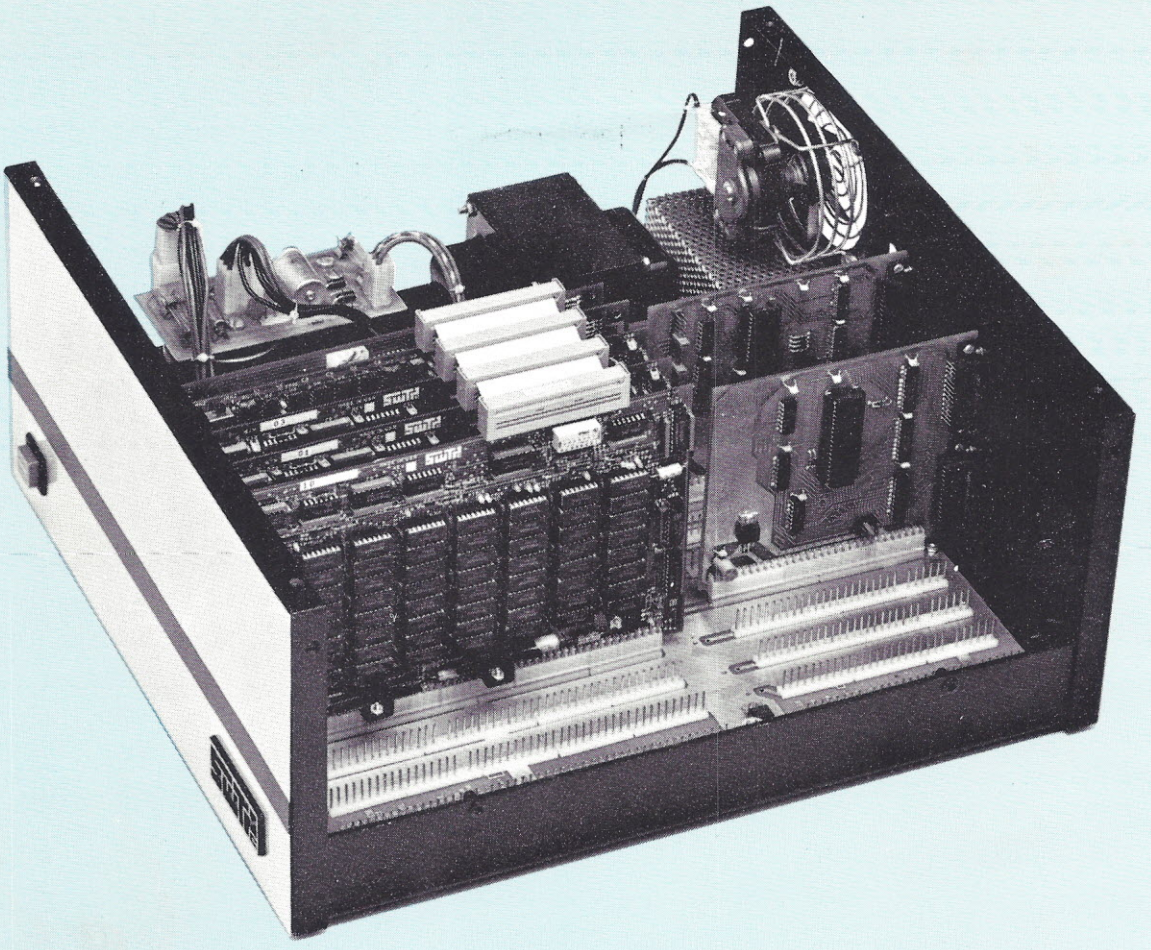

S/09 THE MIGHTY MICRO

MC6809 PROCESSOR – 20-BIT ADDRESS BUS DIRECTLY ADDRESSES UP TO 768K OF RAM

Performance and capabilities never before possible are now available to you in the SWTPC S/09. Computer System.The S/09 uses the Motorola MC6809 processor, the most powerful 8-bit general purpose MPU available. It features more addressing modes than other 8-bit MPU's and an optimized consistent instruction set enhanced by powerful 16-bit instructions. This, plus 24 indexing submodes, promote the use of modern programming techniques like position independent code, re-entrancy and recursion.

The 20-bit address bus makes possible direct addressing of up to 768K of memory without any slow or clumsy processes such as bank switching. RAM memory is designed with independent control and array cards for economical expansion of memory. The DMA and the processor boards can access memory independently for different tasks.

Multiuser capability is "built-in". No additional hardware is required to operate additional terminals. A dynamic memory management system can allocate available RAM in as small as 4K blocks to the various users or tasks.

The dual-bus motherboard design used in the S/09 makes adding I/O ports to the system quick and economical. I/O address decoding for all I/O slots is supplied with the system. All serial I/O cards may be quickly programmed to run at standard baud rates from 110 to 38,400.

Both multiuser and multitasking/multiuser operating systems are available for the S/09. BASIC, PASCAL and an Assembler are immediately available. Editor and Debug programs are also available for use in system development.

S/09 complete as shown with 128K bytes of RAM memory, one parallel and two serial I/O ports. . .$2,995.00

128K memory expansion card $1,995.00

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CIRCLE INQUIRY NO. 66

Low-cost hard disk computers are here

11 megabytes of hard disk and 64 kilobytes of fast RAM in a Z80A computer for under $10K. Two floppy drives, too. Naturally, it's from Cromemco.

It's a reality. In Cromemco's new Model Z-2H you get all of the above and even more. With Cromemco you get it all.

In this new Model Z-2H you get not only a large-storage Winchester hard disk drive but also two floppy disk drives. In the hard disk drive you get unprecedented storage capacity at this price—11 megabytes unformatted.

You get speed—both in the 4 MHz Z80A microprocessor and in the fast 64K RAM which has a chip access time of only 150 nanoseconds. You get speed in the computer minimum instruction execution time of 1 microsecond. You get speed in the hard disk transfer rate of 5.6 megabits/sec.

EXPANDABILITY

You get expandability, too. The high-speed RAM can be expanded to 512 kilobytes if you wish.

And the computer has a full 12-slot card cage you can use for additional RAM and interface cards.

BROADEST SOFTWARE SUPPORT

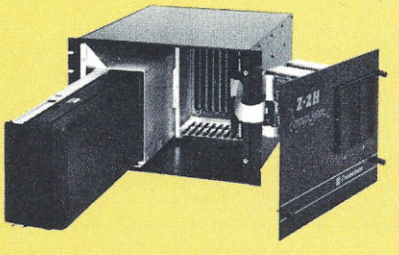
With the Z-2H you also get the broadest software support in the microcomputer field. Software Cromemco is known for. Software like this:

- **Extended BASIC**
- **FORTRAN IV**
- **RATFOR (RATional FORtran)**
- **COBOL**
- **Z80 Macro Assembler**
- **Word Processing System**
- **Data Base Management**

with more coming all the time.

SMALL, RUGGED, RELIABLE

With all its features the new Z-2H, including its hard disk drive, is still housed in just one small cabinet.



Hard disk drive at lower left can be interchanged just by sliding out and disconnecting plug. Seven free card slots are available. Z-2H includes printer interface card.

Included in that cabinet, too, is Cromemco ruggedness and reliability. Cromemco is time-proved. Our equipment is a survey winner for reliability. Of course, there's Cromemco's all-metal cabinet. Rugged, solid. And, there's the heavy-duty power supply (30A @ 8V, 15A @ +18 V, and 15A @ −18V) for circuitry you'll sooner or later want to plug into those free card slots.

CALL NOW

With its high performance and low price you KNOW this new Z-2H is going to be a smash. Look into it right now. Contact your Cromemco computer store and get our sales literature. Find out when you can see it. Many dealers will be showing the Z-2H soon—and you'll want to be there when they do.

PRESENT CROMEMCO USERS
We've kept you in mind, too. Ask about the new Model HDD Disk Drive which can combine with your present Cromemco computer to give you up to 22 megabytes of disk storage.

CIRCLE INQUIRY NO. 15

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VOL. 5, ISSUE 1
SINCE DECEMBER 1975

JANUARY 1980

INTERFACE AGE™

COMPUTING FOR HOME AND BUSINESS APPLICATIONS

THIS MONTH'S COVER

Cover design by Fino Ortiz, Art Director; photography by Don May. The microprocessor-controlled blender was provided by Hamilton Beach and the chips were provided by Computer Stockroom, Lomita, CA.

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MORE CAPABILITIES THAN ANY OTHER PERSONAL COMPUTER UNDER $1,000*

Compare the built-in features of the ATARI® 800™ with other leading personal computers. Whether you program it yourself or use pre-programmed cartridges or cassettes, the ATARI 800 gives you more for your money.

Run your own programs? Easy. Just plug in the 8K BASIC or optional Assembler language cartridge, and go. They're ROM based. That means more RAM for your programs.

Also included with the ATARI 800 is an internal speaker and four separate sound channels, FCC approval, a built-in RF modulator, the ATARI 410™ Program Recorder and a high speed serial I/O.

Peripherals? Add up to 48K of user installable RAM. Or up to four individually accessible floppies.

A high-speed printer. And more to come.

Graphics programs? No problem. The ATARI 800 offers 128 color variations: 16 colors in 8 luminance levels. Plus 29 keystroke graphics symbols and 8 graphics modes. All controlled from a 57 character ASCII keyboard. With upper and lower case.

Or, program it our way. There are exciting programs available and many more on the way for the ATARI 800. Business programs. Home Management programs. Entertainment. And with the 410 audio/digital recorder, you can add Atari's unique Talk & Teach™ Educational System cassettes.

Your way or our way, you'll find that the ATARI 800 is probably the most powerful computer that $999.99* can buy.

And with that power, you get dependability. Dependability built into Atari's custom designed and fully-tested LSI circuitry and lower component count, (less components, less chance for failure).

But if anything ever does go wrong, you'll find a complete network of computer-connected Atari service facilities waiting for you throughout the country.

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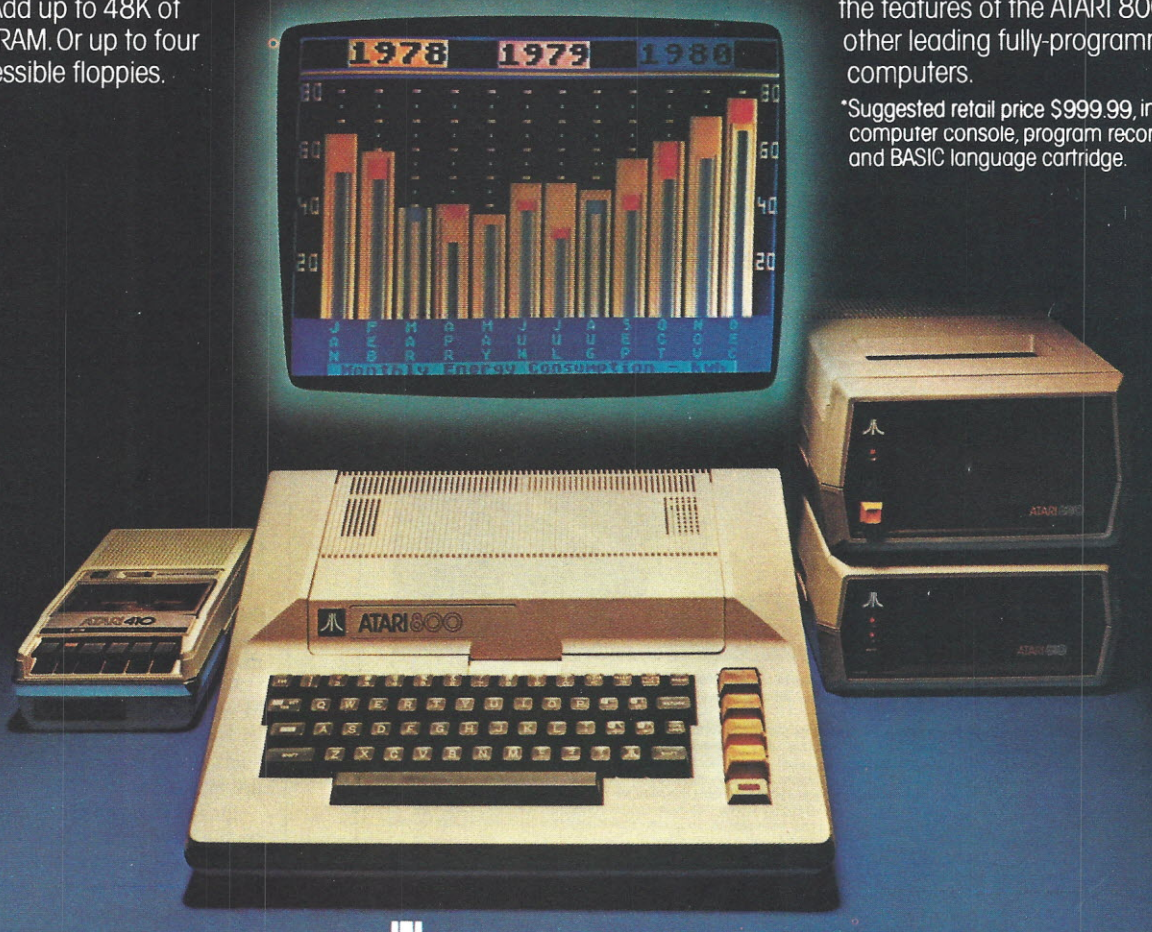
*Suggested retail price $999.99, includes computer console, program recorder and BASIC language cartridge.



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CIRCLE INQUIRY NO. 4

EDITOR'S NOTEBOOK

NO NUKE IS NOT GOOD NUKE

Last year, in this column, I discussed the economy and made some predictions, all of which came true. Some readers felt the pages of INTERFACE AGE were not the place to discuss anything but computers and went as far as to refer to me as a Cassandra.

OK, all's fair and everyone is entitled to an opinion, and I expressed mine. This month I plan the same, but in the area of energy.

During the latter half of 1979, I became upset, incensed, over the statements made by the anti-nuclear people. Of course, everyone was shocked and concerned about the Three Mile Island accident, and everyone from the President to the man in the street has voiced his or her opinion on nuclear power plants.

What really has me concerned is that the anti-nuclear people are flapping their mouths about something they really don't know anything about. To make it worse, they aren't offering any alternatives to the energy situation.

Rather than develop a working method to solve the energy crisis, it appears that our so-called leaders and celebrities feel it is much better to point out the dangers of nuclear power.

Sure I realize there is a certain amount of danger involved with a nuclear power plant. But did you realize that if an oil refinery blew up it could conceivably wipe out a 30 square mile area? Of course, you say there would be no after contamination, but that's not true when you consider water and soil contamination.

What I would really like to see is all of us become vocal and assertive to our representatives regarding energy. Don't let a few egocentric celebrities solve our country's energy problem. Write or call your congressman today—give them your ideas and remind them that they can always be voted out or recalled.

A VISIT TO THINKER TOYS

Have you ever noticed that when a company develops a reputation of being good and turns out excellent products they always have a tendency to do so?

This is definitely the case of George Morrow's Thinker Toys. George's 2½-year-old company has been in the business of turning out high quality, reliable S-100 bus products. The company, housed in a functional warehouse office building, is set up to provide maximum efficiency in the building and testing of the company's product line(s). Each of the 14 employees is trained to perform a specific job, but are frequently cross utilized in other areas of the 11,000 square-foot production area.

PHOTO 1 Jean Morrow at Thinker

Jean Morrow, Photo 1, George's wife and general manager of the company, is in charge of the basic day-to-day operation of the company. George, being an engineer by trade, is engaged most of the time in designing new products and working on the S-100 bus standard.

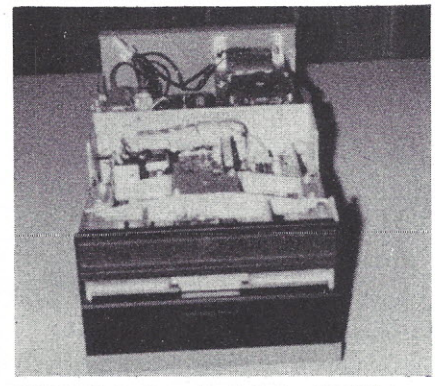


PHOTO 2 8-inch disk for S-100 bus

Recently Thinker Toys introduced their double-sided double-density 8-inch disk for the S-100 bus, Photo 2. This 600K bytes/side drive is really significant since it offers high capability at a reasonable price of $1149. Even more important is that you get Thinker Toys' known quality and reliability at the same time.

Because George realizes that software is just as important as the hardware, he is providing a virtual disk BASIC, BASIC-V™, a DOS and DISKate™ assembler/editor as part of the package. Sometime during the next few months Alan Miller will be reviewing these software offerings so you can get the full flavor of the Morrow system.

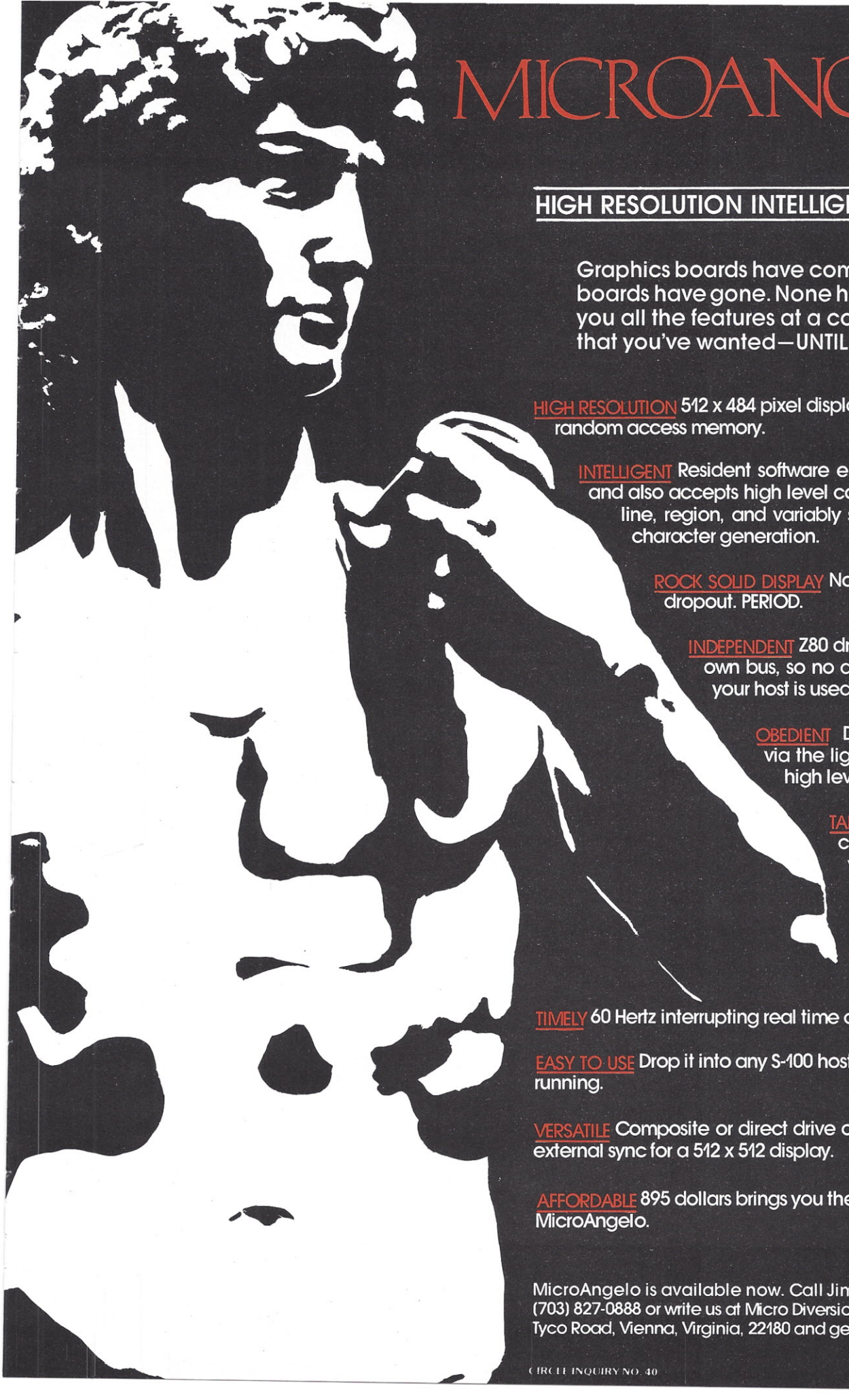
Now if you think George has outdone himself, he has another disk system using hard disk technology coming soon. You really don't want to miss out on the Thinker Toys' offering for 1980 so give 'em a call or write: George Morrow's Thinker Toys, 5221 Central Avenue, Richmond, CA 94804, phone (415) 524-2101.

COBOL AND OTHER SOFTWARE

With the rapid advances being made in business computer systems, it seems only logical that similar advances should be made in business oriented system software.

Although BASIC has been the mainstay of most business applications, it does have its limitations. Even though superb versions such as CBASIC and Microsoft's BASIC(s) are available.

One of the favorite business languages used by the maxi and mini side of the industry is COBOL—Common Business Oriented Language. It wasn't until recently that the power of COBOL was available to the micro user. But Micro Focus™ LTD, 58 Acacia Road, St. John's Wood, London NW 8 6AG, England, telephone 01-722 8843 or telex 285367 MICRO FG, introduced a complete COBOL package for 8080, 8085, Z-80 or LSI 11 processors. The compiler known as CIS (pronounced kiss) COBOL is designed



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HIGH RESOLUTION INTELLIGENT GRAPHICS

Graphics boards have come and graphics boards have gone. None have really given you all the features at a competitive price that you've wanted—UNTIL NOW!

HIGH RESOLUTION 512 x 484 pixel display, from its own 32K random access memory.

INTELLIGENT Resident software emulates a terminal and also accepts high level commands for point, line, region, and variably sized and oriented character generation.

ROCK SOLID DISPLAY No snow, no jitter, no dropout. PERIOD.

INDEPENDENT Z80 driven at 4 Mhz on its own bus, so no address space from your host is used.

OBEDIENT Direct MicroAngelo via the light pen interface or high level software.

TALKATIVE High speed communication with your host over interrupting parallel ports.

EXTENSIBLE Room for up to 8K of PROM.

TIMELY 60 Hertz interrupting real time clock.

EASY TO USE Drop it into any S-100 host and you're up and running.

VERSATILE Composite or direct drive output; provision for external sync for a 512 x 512 display.

AFFORDABLE 895 dollars brings you the creative genius of MicroAngelo.

MicroAngelo is available now. Call Jim Mather at (703) 827-0888 or write us at Micro Diversions, Inc., 8455-D Tyco Road, Vienna, Virginia, 22180 and get creative!

CIRCLE INQUIRY NO. 40


HOW TO MAKE
D I S C U S
2+2
D I S C U S
D I

New 1.2 megabyte quad-density disk. $1545.

Now you can afford to put a million bytes of memory in your S-100 system.

Introducing DISCUS 2+2™ full-size quad-density floppy disk system by Morrow. DISCUS 2+2™ gives you 1.2 megabytes per diskette (600K bytes of double-density data per side). And it's all addressable as easily as main memory with the system's exclusive BASIC-V™ virtual disk BASIC software.

Best of all, DISCUS 2+2™ comes complete, assembled, and ready to run for just $1545. Included in the system price are an S-100 controller, factory-mounted full-size disk drive, a complete library of pre-interfaced software, even cables and connectors.

But you don't have to get your first million in one big megabyte. Morrow's DISCUS/2D™ single-side double-density floppy disk system gives you 600K per full-size diskette for just $1149, complete and assembled. And when you want to expand to a full megabyte, just plug in a second drive... both the hardware and software are expandable.

And if economy is a real concern, you can still get started on your million with Morrow's DISCUS I™ 250K single-density disc system. It's delivered complete and assembled for just $995... and will accept up to 3 more drives.

All three Morrow disk systems meet the Proposed IEEE S-100 standard and are compatible with 2MHz, 4 MHz and 5 MHz S-100 systems. A dual-drive cabinet is available as an option with any density you choose.

Why set your goals low and slow with a mini-floppy system? Get started on your first million with a DISCUS™ full-size system by Morrow. See your local computer shop. Or write Thinker Toys,™ 5221 Central, Richmond, California 94804. Or call (415) 524-2101, weekdays 10-5 (Pacific Time).

Morrow Designs **Thinker Toys™**

CIRCLE INQUIRY NO. 70

to run under a variety of operating systems including CP/M, RT 11, ISIS or CDOS.

Although many programmers think of COBOL as a batch processing language, the CIS COBOL is designed for interactive user operations. Such things as screen formats and output displays, or printed forms are easily handled in the design of the language.

Because we feel that COBOL is an important language, we are planning an indepth review by Alan Miller on several different available micro COBOLs. Throughout this year we will also be providing a number of high level useful business programs written in several versions of the powerful language.

Since INTERFACE AGE will be carrying the COBOL banner in the 80s we are naturally looking for COBOL related articles. These articles should be business related rather than tutorial in nature. If you program in COBOL, get our style guide and share your knowledge.

Still on the application scene is a Mail/File program from Galactic Software Ltd., 11520 Port Washington Road, Mequon, WI 53092, (414) 241-8030, Attn: Bill Schroeder. This $99 package is one of the most indepth mail list handling programs I have seen to date. Written in BASIC for the TRS-80, the program was almost two years in the making according to Galactic's division manager Schroeder.

What makes the package exciting is the definition of fields available to the user and the sort routines that are automatic. Even though the Mail/File system is not a database management system in basic design, it does handle records with a speed and accuracy that I have not witnessed in similar systems.

Those of you who may be concerned over whether or not your secretary can immediately use Mail/File will be glad to know that as much time and money went into the development of the 31-page, loose leaf user's manual as did the actual software.

MORE ON XITAN

Since this past September, I have had a number of calls and letters regarding the status of XITAN and orders placed with them. As I mentioned in the November Editor's Notebook, as far as anyone is concerned they are out of business. Neal Colvin called and suggested that anyone who has had difficulty such as paying for goods and not receiving them should contact Sgt. John Conroy at the Hanson, Massachusetts, Police Department, (617) 294-8081. He is in charge of following up on any complaints against the company. Contact him directly rather than any former XITAN employee.

SOME GREAT READING

Those of you who are 6502 buffs will be glad to know that the magazine that you knew and loved as the *Pet Gazette* has been reformatted under the name of *Compute.*

The new magazine is dedicated to telling the world about the 6502-based machines such as Apple, PET, and the Atari. If you're upset over the change from the *Pet Gazette,* don't be. The *Gazette* is available in reprint form for $10 as a best of.

Compute has taken over where the *Gazette* left off and is providing 6502 system users with really valuable information, from sorting routines to product evaluations. To subscribe to this journal send $9 for a one-year (6 issues) subscription to: *Compute,* The Journal for Progressive Computing, 900 Spring Garden Street, Greensboro, NC 27403.

Those of you who are real meat and potato type computer nuts and have embraced the Motorola 6800 series of CPUs will want to send $14.50 for a one-year subscription (12 issues) to: *'68' Micro Journal,* 3018 Hamil Road, P.O. Box 849, Hixson, TN 37343.

The *'68' Micro Journal* is really a magazine designed just for you folks who can't get enough of that wonderful 6800 type technology.

Realizing that any one magazine can't be everything to all people, I personally feel that if you have an interest in this hard-hitting, fast-moving industry, you should try to subscribe to all the journals and papers that fit your specific needs. That's why I really suggest that if you want to read a newspaper formatted journal that gets down to the nitty gritty of what's happening in this fascinating industry, that you subscribe to Jim Warren's *Intelligent Machines Journal.*

Now don't take this wrong. Even though Jim and I have the same last name, we aren't related. And besides that I'm better looking. But what makes *IMJ* important is that on a bi-weekly basis, Jim and his crew cover all of the important news items in the industry in a clear, concise manner.

Possibly even more important is that *IMJ* offers a two-way forum for readers to respond to the industry and vice versa in a timely fashion.

Warren, who is known for his popular West Coast Computer Faires, feels that since he has made money through the faires, *IMJ* is to be a vehicle of returning some of it back to the industry. Although Jim and I frequently disagree on a host of subjects, I have to applaud what he is doing with *IMJ.* Send $18 for a one-year subscription (26 issues) to: *IMJ,* Dept. TW, 345 Swett Road, Woodside, CA 94062.

SOME GREAT THINGS

How many of you have a TRS-80 and want to do such things as using it to write documentation on? Well, first thing you do is get Mike Shrayer's Electric Pencil™, modify the keyboard for upper/lower case, write your text and save it on disk. Then you send the disk to Dale Brown at Brown Graphic Press, 2488 Summit Street, Columbus, Ohio 43202. Within 24 hours, Dale will process the text and send you back beautifully typeset copy. Give Dale a call to get full particulars about the service at (614) 262-3491.

Should you be interested in speeding up your TRS-80 by 50%, you will want a Speedup board for $24.95. You might be interested at the same time in a reverse video board at $11.95, to make your applications a little more enjoyable. If these items

I've finally found a personal computer I respect. Compucolor II.

It's not surprising that professionals get excited about the Compucolor II. It's a totally-integrated 8080A system with full color graphics display, built-in 51K mini-disk drive, and the best cost performance ratio available in a personal computer.

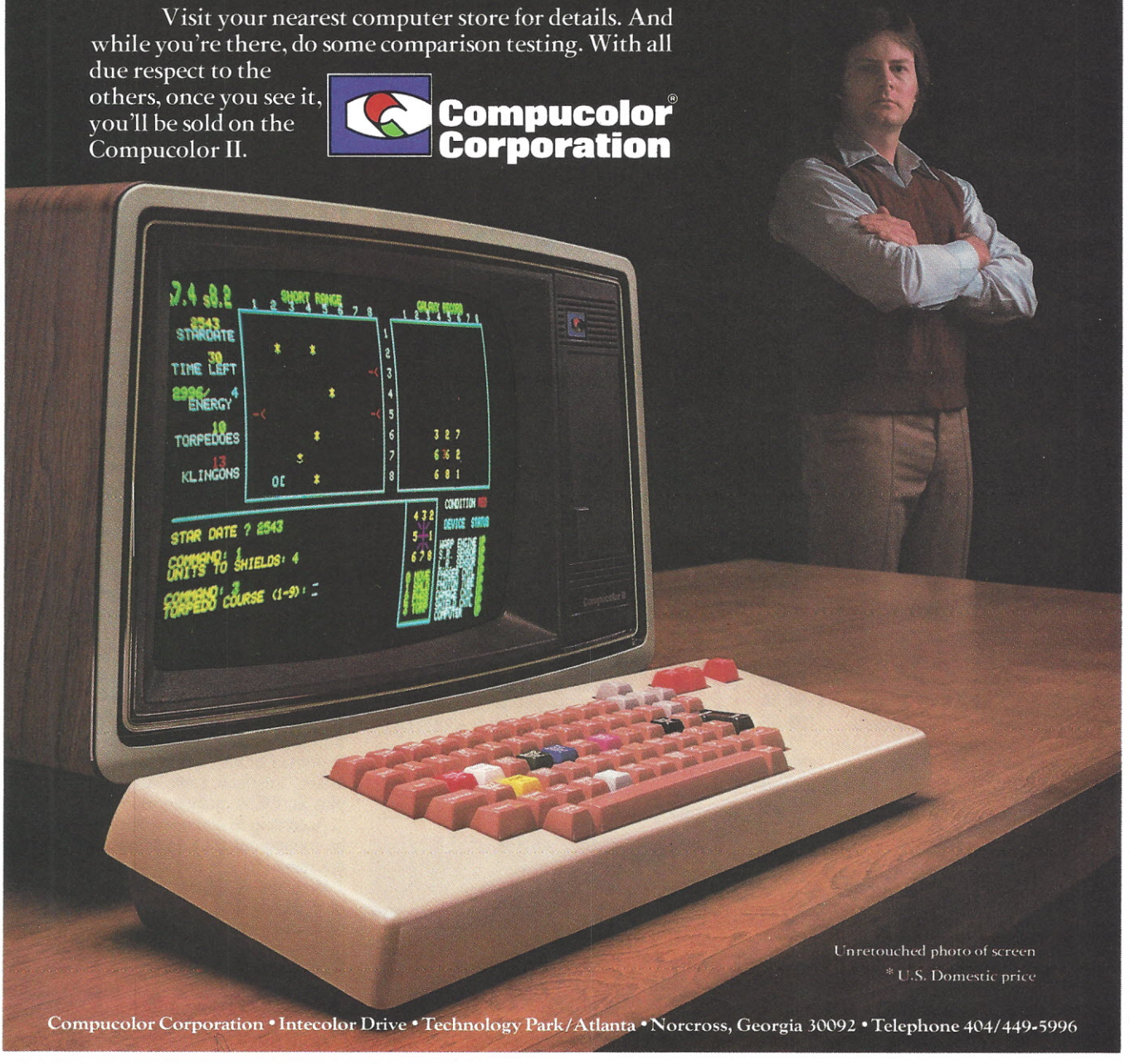
The complete system is only $1595.*And that price includes 8K user RAM, RS-232C compatibility and random access file capabilities.

Our 8 foreground and background colors will boost your comprehension, while introducing you to an exciting new dimension in BASIC programming. The vector graphics have 16,484 individually-accessible plot blocks. And the 13" diagonal measure screen gives you 32 lines of 64 ASCII characters. You also have the flexibility that comes with 16K Extended Disk BASIC ROM.

Compucolor II offers a number of other options and accessories, like a second disk drive and expanded keyboard, as well as expandability to 32K of user RAM. Of course we also have a whole library of low-cost Sof-Disk™ programs, including an assembler and text editor.

Visit your nearest computer store for details. And while you're there, do some comparison testing. With all due respect to the others, once you see it, you'll be sold on the Compucolor II.

Compucolor® Corporation



Unretouched photo of screen

* U.S. Domestic price

Compucolor Corporation • Intecolor Drive • Technology Park/Atlanta • Norcross, Georgia 30092 • Telephone 404/449-5996

meet your needs contact Bill Archbold Electronics, P.O. Box 7123, Sacramento, CA 95826, (916) 362-3627.

Many of you are interested in circuit design products for your hobby interests or a school project. Two items that you will find really helpful are: JUST WRAP™, Photo 3, and CIRCUIT MOUNT, Photo 4. These items, selling for $14.95 and $6.95 respectively, are just two of the handy circuit supplies offered by OK Machine & Tool Corp., 3455 Conner St., Bronx, NY 10475, (212) 994-6600.

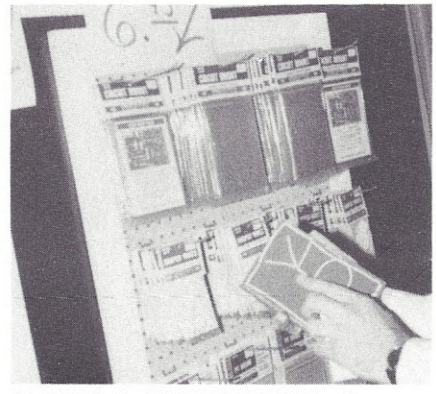


PHOTO 3 JUST WRAP Display

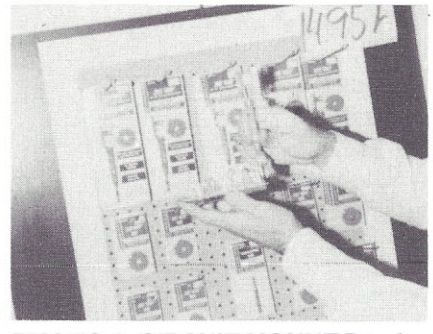


PHOTO 4 CIRCUIT MOUNT Display

OK manufactures just about all the supplies you could want to design circuits or even build complete systems. You can get their complete product catalog by contacting them directly or going into any computer or electronics store nationwide. You will find that the OK product line can be found just about everywhere.

I know that many of you are really interested in getting good test equipment and prototype boards. Continental Specialties Corp., 70 Fulton Terrace, P.O. Box 1942, New Haven, CT 06509, (203) 624-3103, is known for high quality test equipment and development prototype boards.

Two items out of the many that they make are the LPK-1 Logic Probe kit for $21.95,

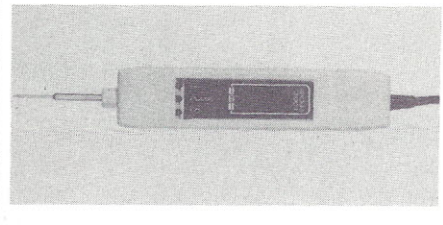


PHOTO 5 LPK-1 Logic Probe

Photo 5, and the Proto Board 6, Photo 6, for $17.95. Both are really handy items to have around, and represent the low cost, high quality items available from CSC.

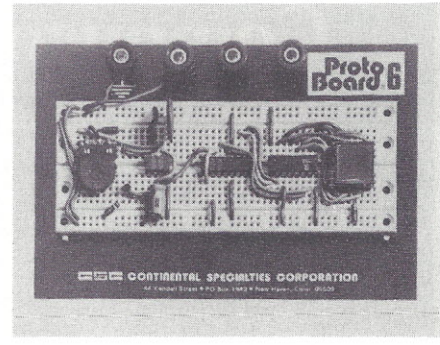


PHOTO 6 Proto Board 6

Getting a hard disk has, up until now, been a pretty expensive affair. However, Micropolis has broken not only the storage barrier but the price barrier by offering an 8-inch Microdisk, Photo 7, using Winchester technology.

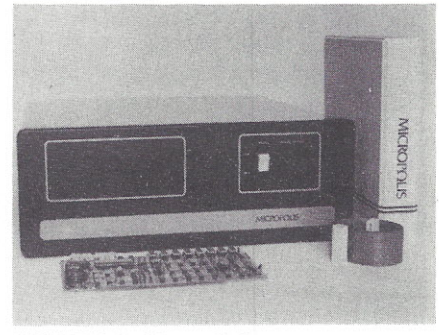


PHOTO 7 Microdisk

The new hard disk system sells in one, two or three platter configuration with 45 megabytes unformatted, 30 formatted in the three-platter configuration. Using the three-platter systems, up to four can be daisy chained with a total capacity of 120 Mbytes plus an additional 1.2M bytes of floppy storage can exist on the system.

Notice that in the photo a cutout appears on the disk's panel. This is space for a floppy backup to be built directly into the hard disk system.

The most exciting thing about the new Micropolis system is its pricing structure, well below $10,000 even for the three-platter system. The two-platter system is below $5,000. The user gets the drive in the configuration of his choice, an S-100 bus controller, interface cable and cord adapters, plus an OSM multiuser operating system.

According to company officials Lifeboat will be coming out with CP/M optimized to make the most efficient use of the new hard disk.

With the capability and pricing structure of this disk subsystem, all I can say is that other hard disk manufacturers are going to be hard pressed to compete with the Micropolis offering. If you want more information, contact your Micropolis dealer or Micropolis Corp., 7959 Deering Ave., Canoga Park, CA 91304, (213) 703-1121.

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The WH89 All-In-One Computer includes two Z80 microprocessors, 5¼" floppy, high-resolution CRT terminal, professional keyboard and 16K RAM (expandable to 48K) — all in one compact unit. It's a complete, balanced system ideal for word processing or any small business need.

The powerful 16-bit WH11A Computer (DEC® PDP 11/03 compatible) is designed around the DEC KD11-HA CPU and accommodates up to 64K bytes of memory. Add the WH27 Dual 8" Floppy (DEC RX01 compatible) for vast storage capacity and immediate access to programs and data. For video output, add the WH19 Smart Terminal with professional keyboard, direct cursor addressing and eight user programmable keys. The WH19 is compatible with the DEC VT52 and ANSII Escape Mode.

The WH11A System is ideal for the complex problems of business and education.

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The WH11A Computer runs all systems and applications software written for the DEC PDP-11/03 and that includes scores of practical programs for business, technical users and education.

The WH27's disk operating system was developed in conjunction with DEC and supports BASIC and Assembly Languages... all available from Zenith Data Systems Dealers.

The disk operating system for the WH89 All-In-One Computer supports MICROSOFT™ BASIC and Assembly Languages. New Autoscribe™ Word Processing Software is also available.

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data systems

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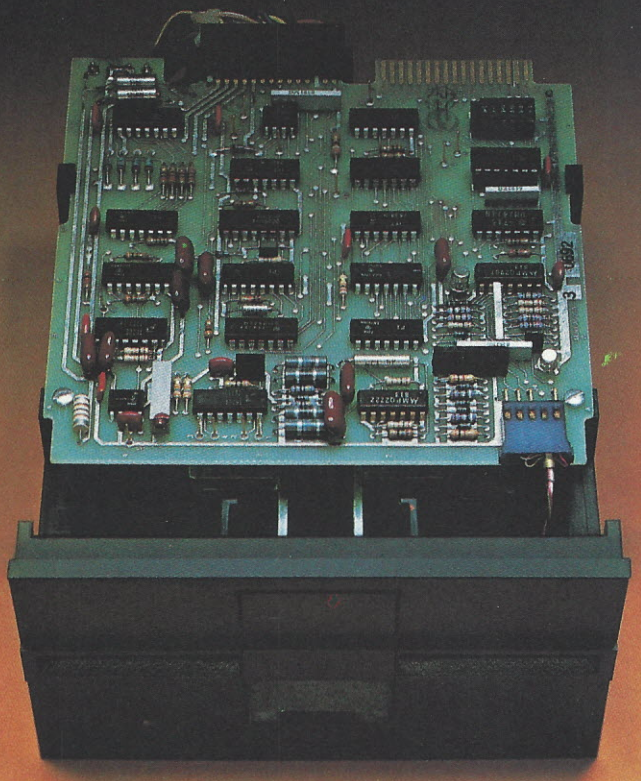
CP-171

If it isn't Shugart, it isn't minifloppy.™



Shugart invented the minifloppy in 1976. Today there are more than 100,000 of the little drives in use. That's because users want the affordable random access data storage of the minifloppy.

Shugart packs years of proven floppy drive technology into this tiny package. Up to 220 kbytes of data storage. Fast random access of about one-half second. And high speed data transfer of 125 kbits per second. Plus sensible, maintenance-free features like write protect to prevent accidental data loss, an activity light to indicate when the drive is selected by your computer and a door interlock to protect your media from damage.

Our proprietary read/write head provides maximum data interchange margins, and it is positioned precisely on the selected track by a patented spiral cam actuator. The DC drive motor with integral tachometer assures accurate diskette rotation and low heat dissipation. A die cast aluminum base plate provides a solid foundation for the drive.

At Shugart, technology leadership is more than a slogan, it's a commitment. Get reliability and value when you invest your money for floppy disk storage. Ask for the standard of the industry. minifloppy. If it isn't Shugart, it isn't minifloppy.

Shugart

435 Oakmead Parkway, Sunnyvale, California 94086

See opposite page for list of manufacturers featuring Shugart's minifloppy in their systems.

TM minifloppy is a registered trademark of Shugart Associates

A NEW WAY TO TEACH AND LEARN

Dr. Portia Isaacson, the lady who heads up the education programs at Electronic Data Systems, dropped by to tell me about EDS' new concept in computer teaching and learning.

The concept, called Evolution 1, is an interesting concept in that it uses broadcast quality video tapes to teach everything from how a computer works to BASIC.

Dr. Isaacson says that each course is scripted by professionals in each given area and a top production company in San Francisco produces each tape. You really wouldn't expect anything less from EDS, would you?

Evolution 1 is aimed primarily at two markets. The first is computer stores, where it will assist in the sale of computers and aid in teaching the rudiments of computers and the BASIC language. The other is in corporations that need to have a method of high level, low cost instruction.

EDS has a complete marketing plan for this unique approach in computer instruction and more details can be obtained by calling or writing: Evolution 1, Electronic Data Systems Corp., 14580 Midway Road, Dallas, TX 75234, (800) 527-0278.

FIVE BOOKS YOU NEED TO HAVE

I really don't know how Bob Albrecht and crew do it. Just about every two months I get a new set of books authored by the terrible trio of Albrecht, Finkel and Brown. This time from John Wiley and Sons, they are *BASIC for Home Computers* a self-teaching guide, and *Atari BASIC*. Both books sell for less than $6 at your local bookstore or computer store. They are really top notch and just what the dragon ordered if you're just getting into the computer field.

From the same publisher is *Personal Computing* by Daniel R. McGlynn. This 263-page book gives the first time reader an excellent overview of computers, languages and an excellent index of just about all the computer stores around the country. For $9.95 it can't be beat.

The book that will probably get the reputation as being the 6502 bible comes from Osborne/McGraw Hill. *6502 Assembly Language Programming* by Lance A. Leventhal, gives an indepth understanding of the powerful little processor.

As with all things written by Leventhal, nothing is left to chance. A great deal of care has been taken by the author to adequately describe each and every function. At $9.50 this book is a steal and would be at twice the price.

Dilithium Press of Portland, Oregon, has recently published a book called *From Dits to Bits* by Herman Lukoff. Available from any computer store and most book stores, I am sure this $12.95 book will become the classic of the industry.

Within the pages of this book, Lukoff, who passed away September 24, 1979, describes how some of the concepts and procedures that we use today came about either by design or accident or just because it worked. This book you won't be able to put down once you start reading it. For the first time you will be able to relive the wonder and excitement of the first computers with the men and women who made them happen.

SOME INTERESTING ITEMS

John Dilks, the father of the Personal Computing shows back east, is opening a computer store, Photo 8, in the New Jersey area. John has no intentions of competing with any of the existing stores, but plans to service the South Jersey area.

John will be featuring systems by Cromemco, Electronic Control Technology, Electro Analytic Systems, Ithaca Intersystems and software from Micro Pro and Cromemco. John says his store is planned to be a friendly

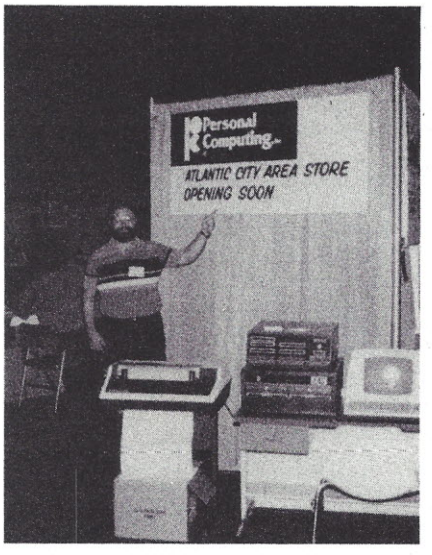


PHOTO 8 John Dilks of Personal Computing

place to come see and enjoy. So all you eastern folks drop in, write or call John Dilks, Personal Computing Inc., Rt. 1, Box 242, Mays Landing, NJ 08330, (609) 653-1188.

Did you know that Tandy is now offering their Radio Shack Model II computer to OEMs? You add the value in the form of software and either sell it under your name or the Tandy label. Very interesting to say the least.

Toshiba has introduced a video disc storage system with read/write capability using laser technology. The disc is capable of storing up to 10 million bits. The system isn't currently available but has a price tag of $36,000, but wait till NCC. Betcha it's half the price — better watch out IBM.

A lot of rumors floating around about Hewlett Packard and their introduction of a small system. Recently HP did a little reorganization of the desk top computer division and the computer systems group, probably preparing for bigger and better

Continued on Page 144

LETTERS TO THE EDITOR

QUERY FROM SOUTH AMERICA

Dear Editor:

The purpose of this letter is to request information on word processing systems for commercial uses. The system may have other business applications also, but it must have capability for a practical and proved word processing, printing all the Spanish peculiar characters (accent on vowels and the letter n with a tilde).

The intention is to purchase one system with all the necessary hardware and software and based on performance, commence importation in quantity.

Arturo H. Carou, Managing Director
Servicios de Comercialization S.C.A.
C.C. 146 Suc 13B
1425 Buenos Aires, Argentina

Mr. Carou, a number of our advertisers offer such systems. Also, we think you might find some good ideas in the new product section.

DISAGREEMENT ON MOD II

Dear Editor:

I would like to point out an error in your story covering the new TRS-80 Model II in the July issue.

On page 58 you state that the TRS-80 Model II and the IBM 5110 both have a storage capacity of up to 2 million characters. However, you are comparing the 5110 with the standard 2 disk drives to the Model II with four drives. Using the highly reliable double density, double sided format, the 5110 will provide up to 1.2 megabytes per diskette. (A total of nine formats are available on the 5110, the lowest being the 3740 interchange format.)

With the total capacity of four drives, the 5110 will hold up to 4.8 megabytes.

More important than simply total capacity is the nuisance of changing diskettes. I have been writing a membership package for the Dallas Museum of Fine Arts over the past year. As we format the diskettes, 800,000 bytes for primary records at 256 bytes each, with additional files for index and address out sort access, we hold 3200 records per diskette. We use six data diskettes for the membership of over 15,000. A similar system on the Model II would require at least twice as many diskettes for data and certainly require that two diskette drives be taken up with programs, not the one we use on the 5110.

Maybe these compromises would be acceptable to save money, but the two are not as equivalent as you claim.

Mike Firth
Dallas, TX

ABOUT MOD II PRINTERS

Dear Editor:

Last week I purchased the July, 1979 issue (Volume 4, Issue 7) of INTERFACE AGE at a local computer store. I was very interested in your article about the Radio Shack TRS-80 Model II computer. After reading it I must say that I enjoyed it and found it informing, but I have a question.

On page 54, under the "Hardcopy" paragraph, you wrote "According to Radio Shack officials, other printers will be offered during the next several months that will provide even further capabilities."

I have a Model II on order, and I've been considering the Line Printers II and III as possible additions. Can you give me any additional details about the new printers: features, prices, etc. I personally have been unable to find out any information from the local Radio Shack stores or the computer center.

In the same issue of the magazine there was another article titled "The Pascal Notebook, Chapter Two." Can you tell me in which issue did Chapter One appear. Also, will there be any chapters after Three? Thank you.

Jeffery J. Kibalo
Bayside, NY

Jeff, Radio Shack's main printer offerings are those mentioned in the article. However, they are always looking at other models to enhance their product.

You might look at our November issue for other possible printer ideas.

Regarding the Pascal Notebook, it began with the June issue and finishes with the April 1980 issue.

WHO'S PLAYING GAMES?

Dear Editor:

Your astrology program (April '79) does not run properly. So I wrote the author, Mike Erlewine with an inquiry and an SASE. No reply. Anger! Now *he* writes in the August/September issue lambasting *himself* for not having a run that matches the program.

Did you put the author's name in by mistake? I agree with the letter that the program may have subterranean bugs that are hidden but deadly.

David O'Neil
Greenacres, FL

David, your points are well taken, and yes we did inadvertently put Mike Erlewine's name on the letter in the August/September issue.

ANOTHER ANSWER TO "I THINK"

Dear Editor,

Yes, we need the microcomputer in the home.

BUT, no one can tell me how I can hook up my PET (or any other) to economically turn on my sprinklers, etc.

I do *not* want to balance my checkbook with the PET. I can do it faster in my head.

I do *not* want to just be able to play games, although I think "Bridge" and "Chess" programs are great. Star Wars doesn't do much for me, nor Pong, etc.

I want (and will pay for) useful home or office controls that the computer can perform faster or easier or more consistently than I can.

Sure, you've told me how to catalog recipes and where in the U.S. I can locate parts for my '32 Chevrolet. BUT is this *all* that I can expect to be able to accomplish?

How about controlling sprinklers; the home heater that turns on if the temperature is below 68 °F to get the house warm by the time the wake-up music or news starts; that

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The Business Computer System That You Can Afford.

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Structured Systems business software can put a microcomputer to work for you.

Gill and Fi... Company — PAGE 1
Balance Sheet
AS OF AUGUST 31, 1978

ASSETS			
CURRENT ASSETS			
Cash	44,760		
Marketable Securities	161,000		
Accounts Receivable	71,362		
Fees Earned But Not Billed	45,300		
Prepaid Expenses	6,265		
		328,587	
FIXED ASSETS			
Office Furniture	13,739		
Leasehold Improvements	23,500		
Computer	11,062		
		48,301	
INTANGIBLE ASSETS			
Patents	13,872		
		13,872	
Total ASSETS			390,760
LIABILITIES AND CAPITAL			
LIABILITIES			
CURRENT LIABILITIES			
Current Part of Long Term Debt	5,000		
Accrued Payroll	9,292		
Income Taxes Payable	18,660		
Trade Payables	24,569		
Accrued Liabilities	962		
		58,433	
LONG TERM LIABILITIES			
Note Payable (Less Current)	20,250		
Retirement Benefits	51,312		
		71,562	
Total LIABILITIES			129,995
STOCKHOLDER'S EQUITY			
CAPITAL STOCK			
Common Stock $100, 1000 issued	100,000		
Paid in Surplus	100		
Preferred Stock $25, 800 iss.	20,000		
		120,100	
RETAINED EARNINGS			
Retained Earnings, Beginning	31,091		
Net Income Brought Forward	110,574		
		140,665	
Total STOCKHOLDER'S EQUITY			260,765
TOTAL LIABILITIES AND CAPITAL			390,760

Unaudited Statements
For Management Use Only

SSG's general accounting, data inquiry, mailing, and communications software packages are bringing real computer power to hundreds of businesses right now. They are ready to go to work for your business.

The Honest-To-Business $12,000 Computer*

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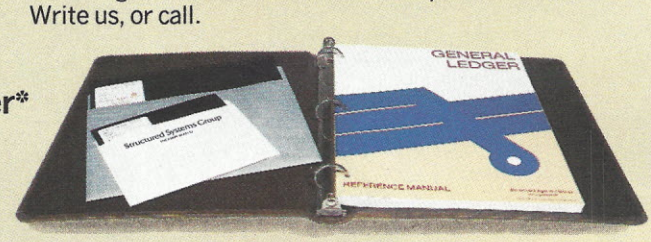
Some Pleasant Surprises

Your computer retailer can give you a demonstration and literature. You might find a solution just right for your business with "off the shelf" prices and delivery times. Or we will be happy to send you literature direct, including a list of our dealers and compatible hardware. Write us, or call.



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Accounts Payable	**QSORT Sorting System**
CBASIC-2	**WHATSIT? Data/Query System**

Structured Systems Group
INCORPORATED

5204 Claremont Oakland, California 94618 (415) 547-1567

* Complete prices will vary with equipment and software selected. Required: 8080 or Z-80 based computer running a CP/M or CP/M-compatible disk-based operating system. Your retailer or SSG can advise on specifics. (CP/M is a product of Digital Research.)

simultaneously turns the coffee pot on; starts the tap water running so it'll be hot in "X" minutes for my shave and shower, etc.

Then, where both spouses work, heat or cool the house for the evening; read-out program from prior input as to plans for the evening or weekend, TV programs, visits, kid's plans, timing, etc.

It should also perform a similar wind-down in the evening. If you normally retire after watching the 11 P.M. news, heater could cut back early for house to cool for sleep; all doors, windows and gates automatically lock; check out of smoke and burglar alarms, and a single, bedside pushbutton turns off all non-necessary electricity for the night.

Today, household microcomputers are only for the hobbyist or children playing games or simple learning. Two years ago, when I bought the PET, I thought the above was then realistic. Maybe next year??

D. F. Ward
Orange, CA

AND ANOTHER

Dear Editor:

What is the future of the home computer industry? The good news is that it's rosy; the bad news is that it points toward specialization.

The good news: with U.S. labor costs at lofty levels, and perennial labor shortages in northern Europe, home computers will expand into labor-intensive tasks like bees in an alfalfa field. Communications and information retrieval are ripe. Most mail is electronically transmittable, short-circuiting the gas-guzzling, labor-hungry, antiquated practice of mailing paper. As the now-chronic shortage of newsprint worsens, periodicals will "go electronic."

Computers will answer telephones, take messages, and transmit information (manufacturers: design a machine that will make a doctor's use of his or her home telephone more efficient, and the medical world will beat a path to your door).

Home computers, or "black boxes"? Ay, there's the rub. The computer user will be naive, and his machine, dedicated. Most citizens have little use for general-purpose machines. Using a micro to balance a checkbook is like killing flies by firing a shotgun at them. But talk to my banker, who can save a fortune by sending me my statement in electronic form, instead of on ever-scarcer paper at always-higher postal rates.

The informed-user, general purpose market is not far from saturation, a development astutely recognized by TI in its design of the 99/4. The explosive growth will now shift to "black-box" applications. Today is the heyday of the Renaissance-man hobbyist, the designer-solderer-programmer-keypuncher-repairman. I find his imminent passing a bit sad. But another frontier will no doubt emerge to challenge the pioneers.

Carl Elvin Whitney
San Francisco, CA

AND ONE MORE

Dear Editor:

A micro in the average home is a marketing goal looking for a need to satisfy. At the present time, the micro is too expensive, mysterious and unnecessary to be a commercial success. A real need or an advertising campaign to create one simply doesn't exist.

Even the names are confusing. Are we talking about a minicomputer, a microprocessor, or a personal computer system? Regardless of the technical distinctions between a computer and a processor, the hardware needs one good name for advertising purposes. The term must be standardized.

In addition, persons not involved in data processing are not regularly exposed to the micro or the mini because the equipment is not a common item in retail stores. Part of the success of Radio Shack's TRS-80 is probably the availability of a working floor model in so many of their retail stores. Exposure encourages familiarity and the possibility of a personal application.

Most non-DPers probably consider the micro to be an expensive electronic game. The marketing of computer games for sports and attachments for games on the television screen encourage this belief. Who needs a mini for Tic Tac Toe?

The problem of finding a marketable need for the micro in the home definitely illustrates one of the theories of Marshall McLuhan. When technology produces a means of communications, the industry searches for a message to be delivered by the new invention. McLuhan theorizes that the new means of communication is usually filled with the content from an older system. For example, televisions were produced and there was a need to find something to show on them. An easy solution was to show movies. Even today, what would television programs be like without movies?

Since the TV industry is still using the older content from movies as a major message, it isn't surprising that the micro industry is still searching for the most marketable content for home applications. To program pencil and paper activities such as checkbook balancing, recipes and colorful graphics definitely supports McLuhan's theory that the new takes from the older means. From the consumer's point of view, who needs electronics when the older method with pencil and paper is efficient, portable, familiar and inexpensive?

There is no reason why the micro shouldn't continue to follow the commercially successful example of the calculator. However, English must be the language. Instead of a lot of add-on options at separate prices, the basic unit should include a variety of components blended together into an attractive package. And the equipment must be readily available in a variety of retail stores.

Another way to increase the commercial power is to have a successful TV star in a series use a personal computer system in a dramatic and practical way. In other words, transform Batman's communication center in the Bat Cave into today's micro marketplace.

FINANCIAL ACCOUNTING SOFTWARE

A generalized, interactive bookkeeping and accounting system created by our staff of CPA's for our accounting practice. The system includes all of the accounting journals, ledgers, and reports necessary for a complete accounting package (i.e. general ledger, payroll, receivables, payables, financial statements, plus a few things not found elsewhere.) This is a tried and true system with over two years of six and seven day per week usage.

The PJA Accounting System with documentation is available for $500. An Alpha Micro computer with either floppy or hard disk is required. Dealerships are available.

CIRCLE INQUIRY NO. 54

TAX PREPARATION SOFTWARE

An on-line, interactive, individual income tax preparation system created by our staff of CPA's for our tax practice. The system prepares Form 1040, related forms, and schedules found in typical returns. This system allows the tax professional to avoid most of the mechanics of tax preparation, greatly increases his/her productivity, reduces errors, and reduces total time required to finish a return.

The PJA Tax System with documentation is available for $500. An Alpha Micro computer with either floppy or hard disk is required. Dealerships are available.

CIRCLE INQUIRY NO. 55

Payne, Jackson and Associates

CERTIFIED PUBLIC ACCOUNTANTS

611 West Ninth Avenue
Anchorage, Alaska 99501
(907) 272-7261 or 279-2351

Part of the problem is the temptation to consider the mini or micro as simply another electronic marvel. It isn't merely one more technical curiosity. It is that catalyst that unites a variety of electrical and electronic devices. The micro is already compatible with the telephone, printers, cassettes, calculators, keyboards, visual displays, and other computers.

In the future, the home computer system, as the electronic manager of detail and other electronic devices, will monitor and adjust energy use, fire sensors, security alarms, budgets, accounts receivable and payable, tax records, entertainment centers, and home offices for lawyers, engineers and others.

Owen Kerr
Buffalo, NY

PHARMACY SOFTWARE

Dear Editor:

We would appreciate articles about software applications for pharmacy — specifically prescription filling and record keeping. The usual business applications of accounts receivable, payable, payroll, general ledger are available OK.

There are some pharmacy packages available as a turnkey system where the software is tied into the hardware. Two of the larger ones are run on IBM Series 1 equipment and the Behrens system run on Burroughs equipment. But these are sold only as a package.

I have seen about a dozen pharmacy systems but they all have some major defect as would apply to my business, and do not offer flexibility of hardware in an otherwise desirable system.

Would appreciate a program or series of programs for prescription processing and record keeping, written exp. in BASIC.

Walter C. Daniels
Daniels Pharmacy
Mechanicsburg, PA

We are looking into this area, as we are all business applications. We hopefully will have at least one for our September/80 Medical issue.

WHERE TO BUY

Dear Editor:

Please inform me where in New York City there are computer stores that sell the small personal type computers. I read your magazine but it seems that all the places you advertise are on the west coast. I have checked the yellow pages but only see the large corporations listed, not stores that would deal with my type of purchase.

I have checked the Radio Shack TRS-80 but would like to inspect other brands before I invest my money in one system only to find that I was not satisfied because I failed to investigate further.

Robert A. Liddell
Bronx, NY

Bob, just to name a couple: Byte Shop of Long Island and John Owens & Associates, Staten Island. We hope that helps some.

COMMON PILOT

Dear Editor:

We appreciate the positive review of COMMON PILOT which appeared in the October issue last year. SWTPC is currently distributing an improved version of COMMON PILOT which supports random access disk files (under FLEX 2.0) and a graphics command with provision for direct cursor addressing, point, and vector plotting and erasing. Obviously the graphic command requires a particular terminal, in this case the CT-82. The COMMON PILOT manual has been rewritten and now includes an index and two short sample programs.

COMMON PILOT is now available on a number of other systems including 8080/Z80 under Helios, North Star, CP/M, or TRS-80 DOS, Terak, TERC and any machine running UCSD Pascal. Other implementations are in progress including a multi-user version for the 6809.

We agree with the reviewer that for a few people the tone of the story in the sample program HORMUZ may be offensive. The purpose of including the program is to make it very obvious that COMMON PILOT allows the author to give the programs a personality or tone, something that would be very difficult to program into a BASIC program.

George Gerhold
Micropi
Lummi Island, WA

UPDATE

GRADUATE FELLOWSHIP APPLICATIONS

The Charles Babbage Institute for the History of Information Processing is accepting applications for a Graduate Fellowship to be awarded for the 1980-1981 academic year to a graduate student whose dissertation will be on some aspect of the history of computers and information processing.

Priority will be given to students who have completed all course work and have completed all requirements for the doctoral degree except the research and writing of the dissertation. However, even incoming graduate students will be considered. Students from all nations are eligible. The stipend will be $5,000 plus an amount up to $2,500 for tuition and fees. The Fellowship may be extended for a period of one to three years if continued support is merited in the eyes of the Selection Committee.

Thesis topics related to aspects of the development of the information processing industry and concerned with specific technological developments in the information sciences, especially if they also deal with the economic and organizational milieu of the developments, will be given priority.

Applications should be sent to Mr. Paul Armer at the Charles Babbage Institute, 701 Welch Road, Suite 224, Palo Alto, CA 94304, by March 15. Applications should include biographical data and a research plan or design. Applicants should arrange for three letters of reference, certified transcripts of college credits and GRE scores to be sent directly to the Institute.

CAI PROGRAMS IN VIRGINIA SCHOOLS

The Craig County (Virginia) Public Schools have recently placed L II TRS-80s in pilot programs in both elementary and secondary schools. These machines are being used with Computer Assisted Instruction (CAI) programs and educational programs.

Because of an apparent scarcity of CAI programs, K-12, school personnel and advanced secondary students are developing such programs. This process is quite slow, however, when the ultimate objective is to offer CAI in a variety of subjects at all grade levels.

Craig County Public Schools are seeking other schools and/or individuals interested in exchanging programs they have developed and are asked to contact Earl R. Savage, Craig County Public Schools, P.O. Box 245, New Castle, VA 24127.

VIEWDATA 80

Technology Marketing Analysis Corporation (TMAC) has been named the North American Coordinator for Viewdata 80, the first major international exhibition and conference on video-based systems and microcomputer industries. The conference will take place March 26-28 in London, England at the Wembley Conference Center.

Over 5,000 buying authorities and representatives from European broadcasting authorities and private companies are expected to attend Viewdata's technical conferences and commercial exhibits. A highlight of Viewdata 80 will be the Prestel Show, a technical extravaganza produced by the British Post Office. Other major exhibits to date include Phillips Industries, GEC, Logica, and Link House, as well as national representatives of France and Germany.

For more information contact TMAC at 680 Beach St., Suite 248, San Francisco, CA 94109, (415) 474-3000 or (800) 227-3477 outside of California.

CSC WINS ARMY PACT

Computer Sciences Corporation has received a one-year contract, with two one-year options, from the U.S. Army Computer Selection and Acquisition Agency. The award is valued at $14.9 million over all three years.

CSC's Applied Technology Division will provide technical assistance to the Army's Computer Systems Command Support Group for work to be performed on the Standard Army Multi-Command Management Information Systems.

CSC will support a wide range of tasks, including systems design and analysis, programming, documentation, prototype installation, testing, system extension, personnel training and implementation project management. Work on this contract will be performed primarily at Fort Lee, Virginia.

Computer Sciences Corporation is headquartered at 650 N. Sepulveda Blvd., El Segundo, CA 90245.

FEDERAL CONTRACT COMPLIANCE SYSTEM

A computerized system designed to help companies meet the Department of Labor's new Office of Federal Contract Compliance Programs (OFCCP) guidelines is now available from Comshare, Inc.

The Comshare system — the Profiles Compliance System — is being introduced immediately following the issuance of the OFCCP guidelines, which require companies to analyze their affirmative action progress with standardized techniques.

The system is prepared specifically for first-line personnel officers, senior compliance officers and personnel directors who must keep tabs on their companies' compliance status.

For more information on the Profiles Compliance System and the related educational program contact Comshare, Inc., 3001 So. State St., Ann Arbor, MI 48106.

THE ELECTRONICS WOMAN

A new monthly publication, *The Electronics Woman,* has been introduced to address the particular needs of female professionals in the electronics industry.

Included in the editorial content will be current business and industrial news, news on issues of particular interest to women, profiles of successful women, and provocative essays to help assess issues facing women in electronics.

The Electronics Woman is a Sage Publication, division of Sage Marketing Communications, P.O. Box 144, Redondo Beach, CA 90277, (213) 374-4557.

DELTAK WORKSHOP SCHEDULE

The 1980 schedule for the Education Coordinators' Workshops sponsored by Deltak, Inc., has been announced. The workshops are designed to assist both new and experienced DP education coordinators in establishing and fulfilling training objectives that relate directly to corporate goals.

A total of 18 ECW's will be held throughout the year. Workshops added to the 1980 schedule will take place in Atlanta; Marina del Rey, California, and Toronto, Ontario, Canada. All others will be held at the Oak Brook Hyatt House, Oak Brook, Illinois.

Workshop topics will include costing, justifying costs, course design strategies, scheduling, designing a learning resource center, record keeping and reporting to management. Also to be covered are techniques for identifying individual skill training requirements, improving interviewing skills and evaluating training resources.

At least one five-day workshop will be held each month in 1980. For complete information contact Lloyd Epstein, Manager, Educational Services Div., Deltak, Inc., 1220 Kensington Rd., Oak Brook, IL 60521, (312) 920-0700.

SELLING TO THE GOVERNMENT

"How to Get Started in Government Business," is a 120-page Operating Manual which provides the small businessman with step-by-step, precise instructions for selling his products to the U.S. government market.

The manual provides a systematic approach to the *mechanics* of getting started. The author, Eli Chappe, a veteran of three decades in government contracting, has developed, and employed as a consultant, a procedure designed to guide the small businessman along this path. A procedure which straight-lines and speeds up the entire processing of penetrating this market.

By following the 27 steps in this manual, the businessman will avoid red tape, considerable paperwork and the maze of regulations.

"How to Get Started in Government Business" is available for $24.95 from Danbury Press, Box 613, Suffern, NY 10901.

MANAGEMENT REPORT

Computers: The Essentials for Senior Management is a clearly written, down-to-earth "primer" that looks at the computer revolution from the senior manager's viewpoint, and provides him with a sound working brief which, at the very least, will put him in a position to ask informed questions and deal effectively with all management aspects of his company's acquisitions and use of computers.

Technical matters are included, but are given only the emphasis necessary to enable the non-technical manager to assess and discuss technical advice and make strategic decisions based on this without a confusing amount of detail.

Further details are available from Financial Times Business Publishing Ltd., Financial Times, Minster House, Arthur St., London EC4 9BH. Telephone: 01-623-1211.

AD HOC COMMITTEE ON STATE LICENSING OF ENGINEERS

An Ad Hoc Committee on State Licensing of Engineers has been formed by the Electronic Industries Association to monitor activities aimed at expanding state regulation of engineering practice.

The Ad Hoc Committee was formed in response to intense efforts to get state legislatures to adopt a "model law" written by the National Council of Engineering Examiners which is comprised of state engineering licensing board members. This model law would require state licenses for those in "responsible charge" of engineering activities, those who are called "engineers" and those who teach engineering in any setting.

NEW ERA IN ELECTRONICS

Very High Speed Integrated Circuits (VHSIC) development represents a quantum leap forward in aerospace/electronic systems, equipment and component/technologies. An initial $200 million DOD seed-bed program represents the beginning of VHSIC technology and future developments.

The first major conference on this new era will be held January 21-22 in Boston. The AIAA and the Technology Transfer Society (TTS) have constructed a four-point conference: 1) the DOD/Tri-service VHSIC program, 2) UHSIC and VHSIC 111, 3) the impact of VHSIC on the defense industry, and 4) viewpoints of the semiconductor industry.

For details, including registration procedures, contact AIAA Conferences, Dept. VHSIC, 5959 W. Century Blvd., Los Angeles, CA 90009, (213) 670-2973.

ELECTRONICS INDUSTRY FILM

The consumer electronics industry has a new film titled "The Link Between Us. . . Electronics." This 27½-minute docmentary portrays the many influences of electronics on our lives. The motion picture is sponsored and presented as a public service by the Electronic Industries Association's Consumer Electronics Group.

"The Link Between Us. . .Electronics" blends a number of vignettes illustrating everyday uses of consumer electronics products for entertainment, information and education.

The documentary will be ready for national distribution early in January. Distribution will be managed by Modern Talking Picture Service, Inc. for free loan to schools, public libraries, civic and fraternal organizations, network, cable and local television stations, movie theaters, and all segments of the consumer electronics and allied industries.

CALENDAR

MICROPROCESSORS IN SYSTEM DESIGN

A seminar for upper and middle management, systems analysts, project managers, design engineers, and engineering support staffs, who find that microprocessor-based systems and subsystems are playing an increasingly large role in their specialties will be offered by the Institute for Advanced Technology on the following dates:

December 17-19	Washington, D.C.
January 21-23	San Francisco

Microcomputer units will be used to provide practical experience with the capacity of microprocessors to solve specific design problems.

For more information contact Darlene Promowicz, Registrar, Institute for Advanced Technology, 6003 Executive Blvd., Rockville, MD 20852.

AGA SYSTEMS CONFERENCE

The Association of Government Accountants (AGA) will sponsor a National Conference of Information Systems on December 3-5 in Washington, D.C. The meeting will address the theme "Information Systems As A Management Tool for the Financial Executive."

Technology update sessions will be offered along with discussion of major issues in the application of modern computer technology to accounting systems.

For details contact Ken Burroughs, DBD Systems, Inc., 1500 N. Beauregard St., Alexandria, VA 22311, (703) 820-3319.

PASCAL WORKSHOP

Polytechnic Institute of New York and the Institute for Advanced Professional Studies are presenting an intensive seminar for engineers, programmers, and technical managers.

"Pascal Programming for Mini and Microcomputers" will be held on December 3-7 at the Holiday Inn, Palo Alto, CA and on April 25-26, May 1-3, 1980 at the Polytechnic Westchester Center, White Plains, New York.

Tuition is $600 and includes extensive course notes, text, and evening reception. For details contact Professor Donald D. French at (617) 964-1412 or the Institute for Advanced Professional Studies, One Gateway Ctr., Newton, MA 02158.

WANG CONFERENCE

Wang Laboratories Inc. will sponsor its annual International Conference for Wang Users at the Sheraton-Boston Hotel, December 3-6.

Interested parties can contact Doug Belnap, conference coordinator, at (617) 851-4111 for more information.

WEST COAST SHOWS

California Computer Show will be held March 13, 1980 at the Inn At The Park in Anaheim, California.

OEM and end-user computer and peripheral products will be exhibited and

demonstrated at the show. For details contact Norm De Nardi, 95 Main St., Los Altos, CA 94022, (415) 941-8440.

DATA PROCESSING SEMINAR

Management Information Corporation presents a two-day seminar specifically designed to meet the needs of company management in understanding computers. The Data Processing for Businesspeople Seminar includes basic concepts of data processing, major data processing applications, small business computer systems, and selection and the future of data processing.

The course will be held at the Cherry Hill Inn in Cherry Hill, New Jersey on December 8-9, 1979.

The price of the course for MIC subscribers is $295 and for non-subscribers is $315. For information contact Management Information Corp., 140 Barclay Ctr., Cherry Hill, NJ 08034, (609) 428-1020.

ADVANCED PROGRAMMING WORKSHOP

A new 5-day hands-on advanced programming workshop by Wintek Corporation will be held December 10-14 in Lafayette, Indiana.

Course objectives include developing those skills required to plan, prepare, test and document microprocessor applications software. Lab projects will include using assemblers and high level language compilers and interpreters.

For details contact Wintek Corp., 902 N. 9th St., Lafayette, IN 47904.

MICROCOMPUTERS & PHYSICS

The joint meeting of the American Association of Physics Teachers and the American Physical Society to be held at the Chicago Marriott Hotel, January 21-24 will have several sessions dealing with microcomputers and instrumentation.

Included are all-day workshops on "Introduction to Microprocessors," and Pascal programming language, and a hands-on session "The Use of Personal Computers in Learning Physics."

For more information contact American Association of Physics Teachers, Graduate Physics Bldg., SUNY at Stony Brook, Stony Brook, NY 11794, Attn: Joint Meeting, (516) 246-6840.

VOICE & DATA COMMUNICATIONS CONFERENCE

Communication Networks '80, the first major national voice and data communications conference of the decade, will be held on January 28-30 at the Sheraton Washington Hotel.

Technology sessions will bring out the latest in telecommunications by tutorials in new areas such as fiber optics, satellite communications, systems networks and more.

CN '80 is produced by The Conference Company. For more information contact Conference Director William R. Leitch at (800) 225-3080.

SCHEDULE DESIGN COURSE

"Scheduling Work Shifts and Days Off for Employees of Extended-Hours Services" course centers around the design of employee work schedules to meet management's productivity objectives and satisfy employee preferences and needs.

The seminar features hands-on use of new low-cost microcomputers and programmable calculators.

The Institute for Public Programs Analysis will hold this training program February 4-8 in St. Louis, Missouri. For details contact TIPPA, 230 S. Bemiston, Suite 914, St. Louis, MO 63105, Allen Gill, Registrar.

MOTION CONTROL SYMPOSIUM

The Ninth Annual Symposium on Incremental Motion Control Systems and Devices will be held at Ramada Inn, Champaign, Illinois, June 2-5.

A "Call for Papers" has been issued by Professor B.C. Kuo, director of the Symposium, which is sponsored by The Incremental Motion Control Systems society in cooperation with University of Illinois, Department of Electrical Engineering and Warner Electric Brake & Clutch Company, Beloit, Wisconsin.

The call is for both theoretical and practical papers related to this theme. Authors should submit a summary of about 500 words by mid-January. Final manuscripts will be due around mid-March. Send all summaries and inquiries to Prof. B.C. Juo, P.O. Box 2772, Sta. A, Champaign, IL 61820, (217) 333-4341.

COMPUTER FAIRE RESCHEDULED

The Fifth West Coast Computer Faire has now been finalized and will take place in San Francisco's Civic Auditorium & Brooks Hall, March 14-16.

This is a change from an original proposal that the 5th Faire be held in Los Angeles next November — a proposal that was canceled some months ago. This is also a change from a more recently announced date in San Francisco.

For more information contact Jim Warren, (415) 851-7075.

MATHEMATICIANS' MEETING

The Program Committee has been appointed and plans are getting underway for the National Council of Teachers of Mathematics 59th Annual Meeting. This convention will be held in St. Louis, Missouri on April 22-25.

For information contact Geraldine Green, 8058 Balfour, Allen Park, MI 48101.

DATES SET FOR PC '80

The Fifth Annual Personal Computing and Small Business Computer Show, PC '80, will be held on October 9-12 at the Philadelphia Civic Center, Philadelphia, Pennsylvania.

For more information contact John H. Dilks III, Personal Computing '80, Route 1, Box 242, Warf Road, Mays Landing, NJ 08330, (609) 653-1188.

the Column

By Patricia Tubbs and Bob Garmston

THE CARE AND FEEDING OF PET. . .

A Computer Instruction Program for Elementary School Children

A new learning experience in computers began for the students and personnel of Lakewood Elementary School in February, 1978, with the arrival of a new Commodore PET and Radio Shack TRS-80 computer. By June, 1978, each of Lakewood's 570 elementary school children had operated one of the two computers.

Lakewood is a lower middle income neighborhood school in Sunnyvale, California, located in the heart of "Silicon Valley." It is a K-6 (kindergarten through sixth grade) school with 570 students in 21 classrooms.

This project started in June of 1977 as a proposal for monies available through Mentally Gifted Minors funding at the local district level. The proposal was written by a committee of interested teachers, the principal and the M.G.M. instructor.

Lakewood's proposal ("The Care and Feeding of PET") included inservice training for all school personnel involved with the computers. Inservice instruction was provided through DeAnza College, the local community college. DeAnza provided the instructor, Bob Albrecht, and five two-hour inservice classes were held at Lakewood School.

Also included in the proposal was the purchase of two computers, the PET and the TRS-80. The name of the TRS-80 was a favorite of the children because of its resemblance to a Star Wars character.

The first class was an inservice presentation for the total school staff. This was scheduled in lieu of the regular staff meeting to insure total attendance and not put an additional burden on teachers' already overloaded schedules. Bob Albrecht brought his PET to our first meetings in January as the school's was not delivered until February, 1978. The remaining classes were for those most interested in the use of computers. Attendance was between 7 and 10 for the remaining meetings, certainly a large group when only one computer is available.

After these classes the computers were moved to the M.G.M. classroom. M.G.M. classes are made up of 10 to 17 gifted students, grouped by grade level. There are three groups meeting for four hours each (in two-hour segments) with the following divisions; 5th and 6th grades, 4th grade, and 2nd and 3rd grades. Lakewood M.G.M. students are taught by Pat Tubbs, M.G.M. instructor. This is a non-certified position in the Sunnyvale School District.

The first steps were to teach children about the computers' mechanical operations such as: connecting components of the TRS-80 in a proper manner, location of power supply switches on both machines (and not to remove the fuse on the PET) and operation of cassette tape player-recorders.

Next, the children were taught to load a pre-programmed game cassette and took turns playing games. This helped familiarize them with the computer keyboards and showed them what types of things a microcomputer can do.

The first programming done by all of the students was a simple two-line program that filled the screen with their name or a graphic design, i.e.:

```
10 PRINT "                "
20 GOTO 10
```

or

```
10 PRINT "@@@###%&&**";
20 GOTO 10
```

All of the children found it extremely exciting to see their very own name printed over and over on the computer screen. The feeling of ownership of this simple program was immense.

By typing in a simple program of this kind, the students began to learn the importance of correct computer punctuation.

A typical conversation between a student and teacher went something like this:

"What happens if I leave off the Semicolon?"
"Try it and see."
"Oh, my name is only in a column."
"What happens if I put a different line number in, say 8 and 635?"
"Try it."
"Nothing happened, why?"

At this time the necessity of punctuation and line numbers to the proper running of a program was discussed. The children decided that counting by tens was a good idea in case they forgot to put in some instruction and needed to add it later.

The students found it fascinating that the computer can accept the lines in any order and then will place them in their proper numerical order for the read-out.

The 5th and 6th grade group wanted to go on to some more detailed programming. We chose multiple-choice answer type questions as the most practical for their purposes. Each student chose an area of interest. Some wrote movie and popular song questions,

PROGRAM LISTING 1

```
    This is an outline to use when writing questions with multiple choice
answers as a program in the TRS 80.
    The line numbers should be changed as needed to meet your program
needs.

        10 REM  program name
        20 REM  your name and date
        30 PRINT  "rules"
        60 PRINT  "PUSH ANY NUMBER AND ENTER KEY TO BEGIN."
        100 INPUT Z
        140 CLS
        150 PRINT "question?"
        160 PRINT "multiple-choice answers"
        170 INPUT A
        180 IF A = correct answer number GOTO 210
        190 PRINT "response if wrong":  GOTO 220
        210 PRINT "response if correct"
        220 END (or return to line 150, renumber by 100's and
                continue with next questions)


       (All of the statements in lower case print are to be replaced
        by student programmer)
```

PROGRAM LISTING 2

Program for P E T

```
10 REM NAME QUIZ-TIGERS READER
20 REM CONNIE DAVIS APRIL 4, 1978
30 PRINT "RULES CHOOSE THE RIGHT"
40 PRINT "NUMBER OF THE ANSWER.  TYPE"
50 PRINT "NUMBER AND PUSH RETURN."
55 PRINT "MATCH THE NAMES"
60 PRINT "PUSH ANY NUMBER AND"
70 PRINT "THE RETURN KEY TO BEGIN "
80 INPUT Z
90 PRINT "[heart]"
100 PRINT "JENNY"
110  PRINT " 1 BEN 2 JENNY 3 JILL"
120 INPUT A
130 IF A = 2 GOTO 150
140 PRINT "IT'S WRONG DON'T CRY" GOTO 200"
150 PRINT "ALL RIGHT"
200 PRINT "BEN"
210 PRINT " 1 GUS 2 BEN 3 DAN"
220 INPUT A
230 IF A = 2 GOTO 250
240 PRINT " IT'S WRONG DON'T CRY": GOTO 300
250 PRINT "ALL RIGHT"
300 PRINT "JILL"
310 PRINT "1 DAN 2 JILL 3 TIGER"
320 INPUT A
330 PRINT IF A =2 GOTO 350
340 PRINT "IT'S WRONG DON'T CRY": GOTO 400
350 PRINT "ALL RIGHT"
400 PRINT "TIGER"

410 PRINT " 1 DAN 2 JILL 3 TIGER"
420 INPUT A
430 IT A = 3 GOTO 500
440 PRINT " IT'S WRONG DON'T CRY": GOTO 500
450 PRINT "ALL RIGHT"
500 PRINT "YOU DID A GREAT JOB"
510 PRINT "GIVE A FRIEND A TURN"
520 END
```

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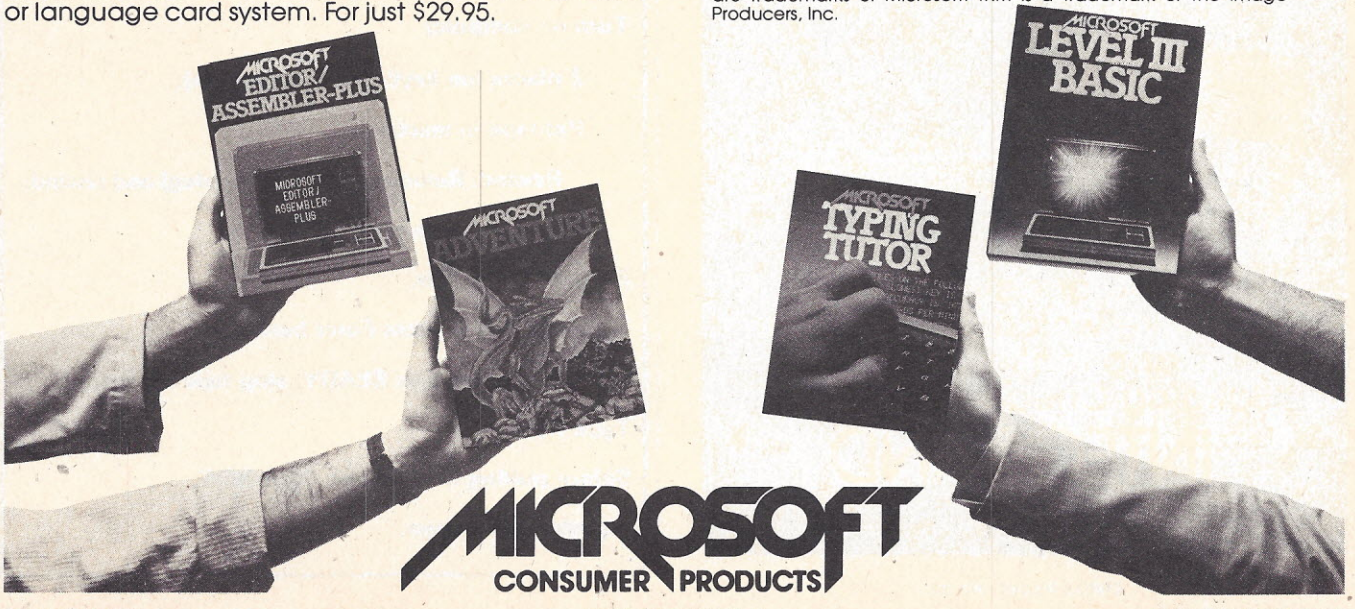
Microsoft Adventure. Only Microsoft offers Adventure complete, as originally written for the DEC PDP-10, now implemented on personal computers. The ultimate fantasy/logic game, Adventure allows you to explore the depths of the "Colossal Cave," collecting treasures and magic, solving puzzles, avoiding hazards and adversaries—including the dreaded killer dwarves. Don't be fooled by imitation or incomplete versions. Only Microsoft has it all. Adventure fills an entire disk with everything you need for your exploration. Written by Gordon Letwin, of SOFTWIN, Associates. Adventure for the TRS-80 requires a single-disk, 32K system. For the Apple II,** a single-disk, 32K system with either the standard disk or language card system. For just $29.95.

Microsoft Typing Tutor. There's no easier way to master your keyboard! Faster and more efficient than any other teaching method, Typing Tutor helps you if you're starting from scratch or simply building speed. The secret lies in Typing Tutor's exclusive TRM™ or "Time Response Monitoring" software. TRM monitors your keyboard 20 times per second so the computer can evaluate your skill. Your speed. Your errors. Your weakest keys. Typing Tutor tells you where you stand then automatically adjusts itself to help you improve. Written by Dick Ainsworth and Al Baker of the Image Producers, Inc. For the Apple II with 16K and Apple BASIC or the TRS-80 with 16K and Level II BASIC. Priced at $14.95.

Microsoft Level III BASIC. Upgrade your Level II TRS-80 and increase your programming efficiency without additional hardware. Microsoft Level III loads from cassette tape on top of the Level II ROM. It gives you every feature of Disk BASIC except disk file commands. But that's not all—Level III's high-speed graphics turn your TRS-80* into a virtual electronic drawing board. And there's program renumbering, long error messages, quick shift-key entries, time-limit INPUT statements and many more features. System requirements: Level II BASIC and 16K. Occupies 5.2K RAM. Priced at $49.95.

Where To Buy. Microsoft Consumer Products are sold by computer retailers nationwide. If your local computer store doesn't have them, call us. Phone (206) 454-1315. Or write Microsoft Consumer Products, 10800 Northeast Eighth, Suite 819, Bellevue, WA 98004.

*TRS-80 is a trademark of Radio Shack Corp. **Apple II is a trademark of Apple Computer, Inc.,™ Editor/Assembler-Plus and Z-Bug are trademarks of Microsoft. TRM is a trademark of The Image Producers, Inc.



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others asked questions from fairy tales, and still others chose vocabulary words from the first grade reader.

The questions and their respective answers were written out on paper, giving each of the choices a number.

After the questions and answers were written, we gave the students a worksheet to use as their guide. We discussed the procedures on these guides and the variations needed for the two computer dialects.

While writing these programs, students learned to include line numbers, REM (remark) statements, INPUT statements, CLS (clear screen) instructions, PRINT statements, IF statements and GOTO statements. Also, the vital importance of correct computer punctuation.

After typing in their programs the students learned to SAVE these programs on cassette tapes.

One example of student interaction with the computer can be seen in the case of Connie. Connie Davis is a fifth grade student and has written a program in both dialects of BASIC. She wrote the program especially for use by first graders using words from one of the first grade vocabulary lists. Connie's brother is in the first grade and she wanted to do something he could read easily.

Table 1.

PET INSTRUCTIONS

Turn on computer (behind machine).

Put in tape.

Rewind.

Type: LOAD (press return button).

Press PLAY button (press STOP when cassette stops).

When computer says READY, Type RUN.

Before putting in new tape, type NEW (push return).

TRS 80 INSTRUCTIONS

Turn on computer

2 places (on keyboard & on screen).

Put tape in machine.

Rewind: Remove plug (remote plug) and rewind; then plug back in.

Press PLAY button.

Type CLOAD & press Enter button.

When computer says READY, stop tape recorder.

Type RUN

Before putting in new tape, type NEW, push enter button.

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Allow 6-8 weeks for delivery

April was the date of Back to School Night for parents at Lakewood. The students were all anxious to show their parents "their" computers and how much they had learned.

About a 90% turnout of parents of these children occurred. This is an extremely high percentage and compares with about a 60% turnout schoolwide. Parents were not disappointed in the results; in fact, they were extremely proud of their children. There was quite a clamor to get to the computers so that each student could explain their success in computer programming to their friends and parents. The parents on the other hand were quite surprised and pleased at how much their students had learned.

Having the microcomputers in an elementary school has drawn many visitors to Lakewood. Visitors from Illinois, Texas and all over California have come. This was quite thrilling to the students for a time; but it soon became evident that visitors took programming time and there really was not much of that.

The students were not familiar with a typewriter so it took a considerable amount of time to hunt and peck in the simplest and shortest program. We believe that a keyboard set up in alphabetical order would be a real asset to those unfamiliar with the typewriter keyboard.

The next level of concern was to be sure that every one of Lakewood's students had an opportunity to use one of the computers. With nine weeks of school left and 21 classes, it was decided to send the computers out to the 4th, 5th and 6th grade rooms for one week each and to the K through 3rd grade rooms for three days each.

Two or three 5th and 6th grade M.G.M. students took each computer to the assigned classroom. While there, they gave instructions on basic operations of the computers. These instructions were also taped to the computers (Table 1) and demonstrated the proper method for loading a program. At this time they also told about writing their own program and loaded it into the machine for their classmates to use.

We also had basic random number addition, subtraction and multiplication programs prepared so that if the teacher wanted his/her students to have some practice with math, that was also available.

Most of the teachers made a schedule for their classroom, allowing each student 5 minutes computer time each. After everyone had a turn the schedule would be repeated.

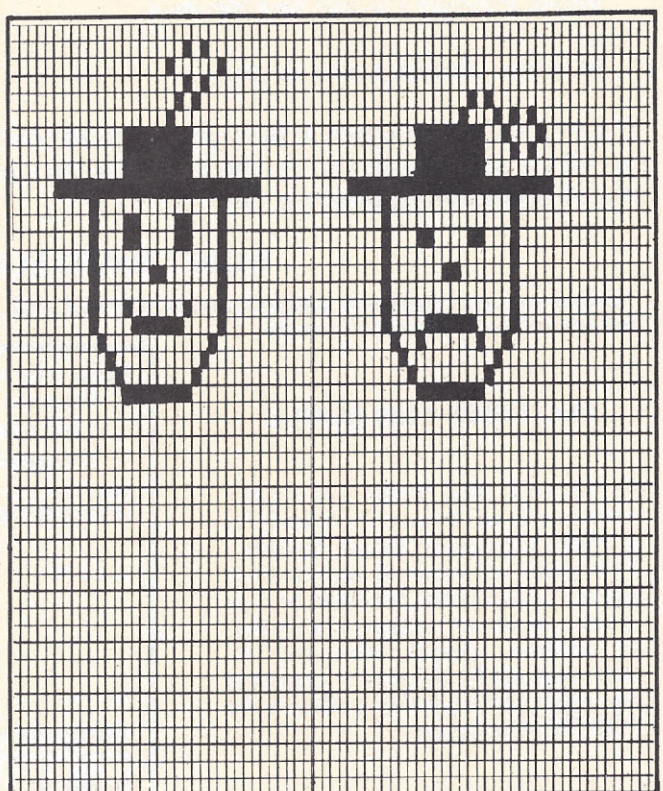


Figure 1.

PROGRAM LISTING 3

```
10 REM THIS IS A VOCABULARY
20 REM EXERCISE FOR HOUGHTON
25 REM MIFFLIN READER - TIGERS
30 REM  WRITTEN BY PAT TUBBS
40 REM APRIL 1978
45 CLS:P.:P.:
50 P. "WHAT IS YOUR NAME?"
60 INPUT A$
70 P. "HI, ";A$
80 P. "PICK THE RIGHT WORD FOR EACH SENTENCE."
90 P. "TYPE ITS NUMBER AND PUSH ENTER BUTTON."
100 P. "PUSH ENTER WHEN READY TO START."
110 INPUT B$
120 CLS
130 P.
140 P. "SEE THE _____."
150 P. "1. WANT  2. HELP  3. ROCKET"
160 INPUT A
170 IF A = 3 THEN GOTO 200
180 GOSUB 2000 :REM FROWN FOR WRONG ANSWER
190 GOSUB 1300 : REM DELAY
195 GOTO 120 : REM REPEAT QUESTION
200 GOSUB 1400 : REM COMPLEMENT
210 GOSUB 1000: REM SMILE FACE
215 GOSUB 1300: REM DELAY
220 CLS:  P.:P. " I WANT A _____."
230 P."1. HAVE  2. TRUCK  3. ARE"
240 INPUT A
250 IF A = 2 THEN GOTO 290
260 GOSUB 2000
270 GOSUB 1300
280 GOTO 220
290 CLS:  GOSUB 1400
300 GOSUB 1420
305 GOSUB 1000
310 GOSUB 1300
320 CLS:P.:P."TIGERS ARE IN THE _____."
330 P. "1. THIS 2. ZOO 3.WHERE"
```

Program Continued

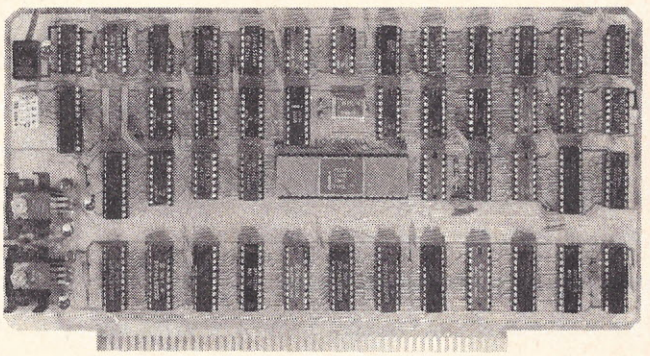
```
340 INPUT A
350 IF A =2 THEN GOTO 390
360 GOSUB 2000
370 GOSUB 1300
380 GOTO 320
390 CLS: GOSUB 1400
400 GOSUB 1430
405 GOSUB 1000
410 GOSUB 1300
420 CLS:P.:P. " I _____ THIS CAT."
430 P. " 1.  ARE  2.  ME 3. WANT"
440 INPUT A
450 IF A = 3 THEN GOTO 490
460 GOSUB 2000
470 GOSUB 1300
480 GOTO 420

490 CLS: GOSUB 1400
500 GOSUB 1440
505 GOSUB 1000
510 GOSUB 1300
520 CLS: P.:P. " WILL YOU _____ME?"
530 P. "1. HELP 2. THE 3. IS"
540 INPUT A
550 IF A = 1 THEN GOTO 590
560 GOSUB 2000
570 GOSUB 1300
580 GOTO 520
590 CLS: GOSUB 1400
600 GOSUB 1450
605 GOSUB 1000
610 GOSUB 1300
620 CLS P.:P."HE CAN _____ HERE."
630 P. " 1. ON 2. AND 3. COME"
640 INPUT A
650 IF A = 3 THEN GOTO 690
660 GOSUB 2000
670 GOSUB 1300
680 GOTO 620
690 CLS: GOSUB 1400
```

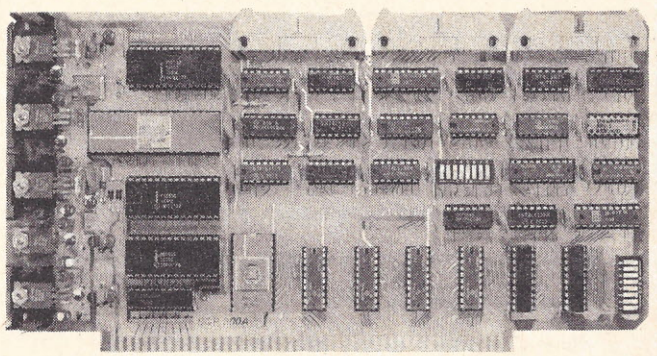
Program Continued

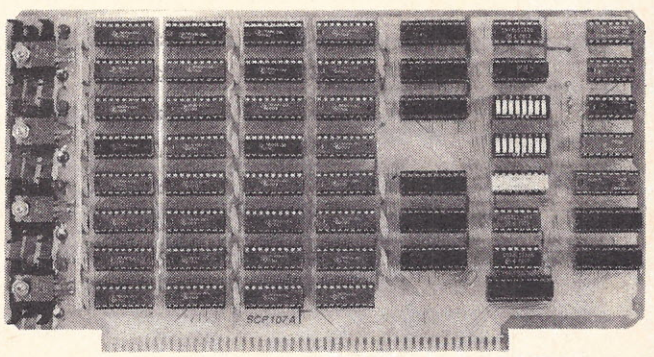
Now! For the S-100 bus

8086 Power

WITH 16-BIT WORD LENGTH







(Prototypes shown)

8086 CPU

This card brings state-of-the-art performance to the S-100 bus. It may be used to upgrade existing 8-bit systems by "swapping" the CPUs or it may form the foundation for a high performance 16-bit system. It will operate with 8-bit, 16-bit, or mixed memory and peripherals. It has a 1-megabyte addressing range. It can be factory upgraded at nominal cost from 4 Mhz. to 8 Mhz. when the faster CPU chip is available. Price — $895.

CPU Support Card

This is a companion to our 8086 CPU. It includes a 2K monitor with machine language debugger and disk bootstrap loader, serial port with software-selected baud rate, time-of-day clock with battery backup capability, two general purpose timers/counters, and a vectored interrupt controller with 7 interrupts generated on board and 8 accepted from the bus. Price — $395.

8/16 Memory Card

Through the use of the sXTRQ line of the proposed IEEE Standard, this memory board will appear to be 8K by 16 bits to our 8086 CPU or 16K by 8 bits to 8-bit CPUs. It is offered with 250 nsec. memory chips only and will perform without wait states with our 8086 CPU using an 8 Mhz. clock. It has 24-bit extended addressing. Price — $595.

Z80/8086 Cross Assembler

This cross assembler runs under CP/M and its derivatives. Its mnemonics are the same as or similar to Intel's ASM-86. It is available in 5" soft-sectored, 5" North Star, or 8" soft-sectored (IBM) formats. Price — $250.

Microsoft BASIC-86

Microsoft's BASIC interpreter for the 8086 is essentially identical in features to their 5.0 release for the 8080 and is ANSI compatible. It is a "stand-alone" version and includes all disk and terminal I/0 drivers. Programs written for any earlier version of Microsoft BASIC will run under BASIC-86 with little or no modification. Price — $350.

MCS-86 User's Manual

By Intel — Feb., 1979, edition. This is the primary hardware and software reference manual for the 8086 CPU. Price — $6.25. (Includes shipping)

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```
700 GOSUB 1470
705 GOSUB 1000
710 GOSUB 1300
720 P.A$;", YOU HAVE DONE A GOOD JOB ON THE TIGERS WORDS."
740 P."KEEP WORKING HARD AND I'LL SEE YOU AGAIN SOON."
760 END
1000 SET (35,1):S.(37,1):S.(33,2):S.(39,2):S.(35,3)
1010 Set (37,3):S.(34,4):S.(36,4):S.(33,5):S.(28,6):S.(26,6)
1020 Set (30,6):S.(31,6):S.(32,6):S.(33,6):S.(34,6):S.(35,6)
1030 FOR X = 28 TO 35:S.(X,7): NEXT X
1040 FOR X = 28 TO 35:S.(X,8): NEXT X
1050 FOR X = 20 TO 43:S.(X,9): NEXT X
1060 S.(24,10):S.(39,10):S.(24,11):S.(28,11):S.(29,11)
1070 S.(34,11):S.(35,11):S.(39,11):S.(24,12):S.(28,12)
1080 S.(29,12):S.(34,12):S.(35,12):S.(39,12)
1090 S.(24,13):S.(39,13):S.(24,14):S.(31,14):S.(32,14)
1100 S.(39,14):S.(24,15):S.(39,15):S.(24,16):S.(28,16)
1110 S.(35,16):S.(39,16):S.(24,17)
1120 FOR X = 29 TO 34:S.(X,17):NEXT X
1130 S.(39,17):S.(25,18):S.(38,18):S.(26,19):S.(37,19)
1140 S.(27,20):S.(36,20)
1150 FOR X = 28TO35:S.(X,21):NEXT X
1160 RETURN
1410 "GOOD JOB,";A$: RETURN
1420 "NICE WORK,";A$: RETURN
1430 "SWELL,";A$: RETURN
1440 "WONDERFUL,";A$: RETURN
1450 "VERY GOOD";A$: RETURN
1460 "PRETTY GOOD,";A$:RETURN
1470 "YEA!!,"; A$:RETURN
1480 "GOOD WORK,";A$: RETURN
1490 "WOW! THAT"S SUPER,";A$: RETURN
2000 CLS: GOSUB 1400:P."PLEASE, TRY AGAIN,";A$

2005 S.(78,4):S.(80,4):S.(77,5):S.(81,5):S.(83,5):S.(85,5)
2010 FOS X= 72 TO 79:S.(X,6): NEXT X
2020 S.(82,6):S.(86,6)
2030 FOR X= 72 TO 79:S.(X,7):NEXT X
2035 S.(83,7):S.(85,7)
2040 FOR X = 72 TO 79 :S.(X,8):NEXT X
2050 FOR X = 64 TO 87:S.(X,9):NEXT X
2060 S.(68,10):S.(83,10):S.(68,11):S.(83,11):S.(68,12)
2070 S.(72,12):S.(73,12):S.(78,12):S.(79,12):S.(83,12)
2080 S.(68,13):S.(83,13):S.(68,14):S.(75,14):S.(76,14)
2090 S.(83,14):S.(68,15):S.(83,15):S.(68,16):S.(83,16)
2100 S.(68,17):FOR X = 73 TO 78:S.(X,17):NEXT X
2110 S.(83,17):S.(69,18):S.(72,18):S.(79,18):S.(82,18)
2120 S.(70,19):S.(81,19):S.(71,20):S.(80,20)
2130 FOR X=72 TO79:S.(X,21):NEXT X
2140 RET
```

After the basic introduction to the computers, the M.G.M. students were "on call" for any troubleshooting that might be necessary. Both the principal and the M.G.M. instructor view Lakewood's classroom teachers as extremely cooperative and supportive in allowing their troubleshooters to leave when needed, and also in accepting the disruption to the classroom schedule the computers caused.

After the upper grades had all used the computers, scheduling began in the primary grades. We had very few programs simplified enough for K and 1st graders to use. We wrote one using first grade vocabulary for the TRS-80 (Program 3) and we had a similar program for the PET.

First graders were really fascinated by the computers' ability to know their name and really enjoyed seeing the smiley face or sad face. The thrill of a correct answer was apparent on their faces.

We did not have a simple enough program prepared for kindergarteners, but chose instead the simple name program illustrated in the beginning of this article. After typing in all but the name we allowed each child to pick out the letters of his/her name and type them in. One problem not anticipated was the letter pictures on the keyboard.

Kindergarteners knew how to write their names with an upper case letter and lower case letters following this; e.g., Pat. However, the computers use only upper case letters; e.g., PAT. We explained that these computers only knew the upper case alphabet. (Dumb machines. . .right?)

Next, the problem emerged of the upper case letters looking different from the way the letters they had learned; 1 instead of I. Also, the keyboard showed one symbol and the screen another. These were problems neither we nor our older students were aware could occur. But after everything was explained, the children had a good time making their names appear on the screen.

By the time school was out for summer vacation, everyone at Lakewood School, students, teachers, aides, secretaries, custodians and cafeteria workers, had had a chance to use the computers.

If money is available this year, school plans call for upgrading the TRS-80 to Level II with 16K. Money will also need to be budgeted for possible repairs and for cassette tapes.

This year, we will again teach simple programming. Students should be able to get into some slightly more difficult programs using GOSUBs, time delays and graphics.

Time is always a factor to consider when working with students and with limited numbers of computers; however, with a full school year ahead there is every promise of a great deal of accomplishment.□

ABOUT THE AUTHORS

Robert Garmston has served as principal of Lakewood Elementary School in the Sunnyvale School District for three years. Prior to that he principaled elsewhere in the Sunnyvale School District, in Saudi Arabia for the Arabian American Oil Company, and served as Director of Instruction for the Live Oak School District in Santa Cruz and in the Bellevue School District in Santa Rosa.

Mr. Garmston earned his BA and MA from California State University at San Francisco and is completing his EDD at the University of Southern California.

Patricia Tubbs, instructor of gifted elementary school children, has been working for five years as an instructor of Mentally Gifted Minors at Lakewood Elementary School.

Her experience with programming computers had been nil until the arrival of the TRS-80 and PET.

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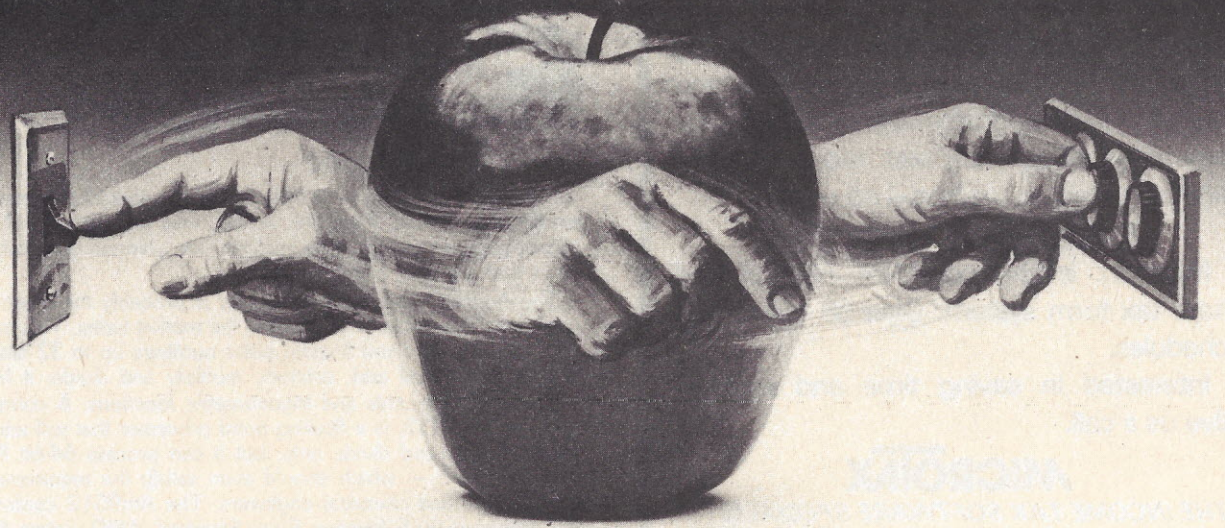

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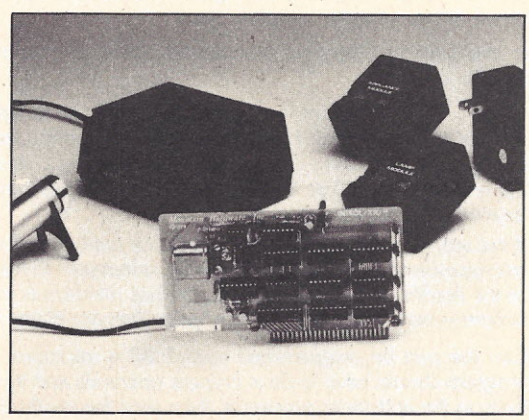

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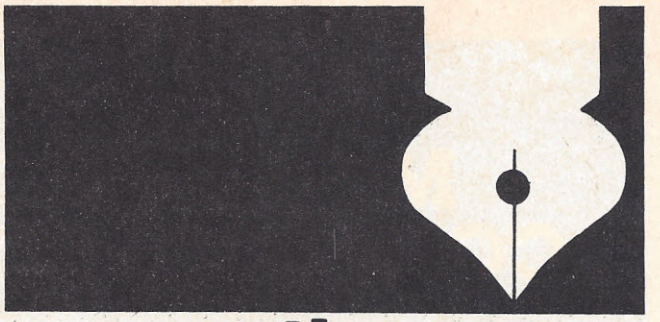

From the Fountainhead

By Adam Osborne

Among the welter of parts being offered as special purpose **arithmetic processors,** there are, in fact, very few that fit well into a microcomputer system. The majority are warmed-over calculator chips that are hard to interface or use.

The Am9511 arithmetic processor is probably the most widely used special purpose processor on the market today. This part can handle fixed point and floating point numbers up to 32 bits wide. The Am9511 will add, subtract, multiply and divide; it handles logarithms, exponents and trigonometric functions. A companion part, the Am9512, is a floating point processor that will add, subtract, multiply and divide only, but it can process 64-bit floating point numbers — which should even satisfy the requirements of astronomers and chemical engineers. The Am9512 conforms to the proposed IEEE Floating Point Standard. AMD claims that the Am9511A is identical to the Am9511; the "A" appendage supposedly identifies a new chip mask — and that is all. In fact, it is rumored that there were problems associated with the Am9511 reset, plus certain transcendental functions. But AMD is not talking.

It is a real pity that semiconductor manufacturers are so reluctant to tell users what is wrong with their parts, preferring to let users stumble on the problems individually, and en masse — after they have bought the part. AMD appears to be particularly guilty in this respect. For example, neither the Am9511 nor the Am9512 divide operation returns a remainder.

I received preliminary documentation from AMD some time ago. The technical writer had noted in a couple of cases that the divide function of the Am9512 did not return a remainder, but the reviewer (presumably a person in marketing or engineering) had crossed out this information. Presumably the reviewer felt that truth in advance of purchase would hurt sales more than problems after the purchase.

Knock it off, AMD — and all you other people!

Notwithstanding my criticism of AMD's documentation, the Am9511 and Am9512 are, without a doubt, the parts of choice in most microcomputer systems that require floating point arithmetic or transcendental functions. What makes these parts of choice is the ease with which they can be incorporated into a microcomputer system. They connect to a typical microcomputer system bus as easily as an 8255 I/O port — or any other microprocessor support device. And a microprocessor program that utilizes these two parts is no more complicated than the program needed to control any other typical microcomputer support circuit.

When **analyzing arithmetic processors,** these are the important criteria to consider:

1. Is the arithmetic processor going to operate in conjunction with a microprocessor? My comments in this column assume that it is. In fact, using the Am9511 and Am9512 as stand-alone devices would be impractical. Calculator chips are preferable as stand-alone devices.
2. If the arithmetic processor is to be used in conjunction with a microprocessor, how simple is the bus interface? In the case of the Am9511 and the Am9512 the bus interface is trivially simple — select logic and normal bus buffers are all you need.
3. Can the part be programmed easily? All a microprocessor program should have to do is prepare operands and transmit them to the arithmetic processor, then read the result when it is ready. Any additional overhead is unnecessary. The

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Am9511 and the Am9512 fulfill this requirement.

4. Are execution times fast enough? Here you may have a problem with the Am9511 and the Am9512; a fixed point multiplication requires approximately 30 microseconds, while a floating point multiplication requires more than 50 microseconds. Transcendental functions require more than a millisecond to execute. If these execution times are too slow, then you will have to select special high-speed single function devices — which are readily available for multiplication, but are currently unavailable for division or transcendental functions. Calculator chips are slower than the Am9511 or Am9512 and cannot be selected where execution speed is important.
5. Are the results accurate enough? Accuracy is an important factor for trigonometric functions with very large or very small operands. In these areas, the results can be quite poor. Be sure you understand the accuracy of the data you are generating.

Here is a list of part numbers for high-speed multipliers:

From TRW: the TDC1010J, the HJ series and the TDC1008J
From Monolithic Memories: the 67558
From AMD: the Am25LS2516

But you pay dearly for high-speed multiplication; these parts are power hungry, sometimes consuming more than a watt of power per part.

Intel's 8089 I/O Processor is the first of what I predict will be a new breed of CPUs that handle specific functions in a large microcomputer system. I described the 8089 in a recent column. This part handles all I/O channel logic for 8086 microcomputer systems, thereby relieving the master microprocessor of all I/O chores. During the next few years I expect a large number of such special purpose microprocessors will be announced.

But the 8089 is not really a brand-new idea; many of the peripheral controller chips on the market today are, in fact, one-chip microcomputers with special purpose read-only memory programs. More peripheral controllers than you would believe are really nothing more than 8048 or 8041 one-chip microcomputers, with appropriate programs stored in their read-only memory.

I recently received a very interesting form letter from **Digital Equipment Corporation.** They announced the grand opening of a computer store in San Francisco.

I believe that Digital Equipment Corporation's new selling philosophy has strengths and weaknesses.

I am sure that Digital Equipment Corporation, together with other minicomputer manufacturers, will discover that computer stores are an inexpensive and effective way of selling small business computers.

The weakness in Digital Equipment Corporation's strategy is that their company stores are going to sell their own products only. Right now I am sure that Digital Equipment Corporation looks upon the computer store as an experiment in selling technique. The manufacture of computer hardware is looked upon as the source of profit. The computer store, per se, is not a profit generator in this scenario. Therefore it would be inconceivable for a Digital Equipment Corporation computer store to sell any competing hardware systems, even though carrying multiple lines would greatly increase the store's business.

As hardware costs go down, the portion of a computer system's price that covers retailing and customer interface will become even more significant. And this part of the system's price, together with associated profits, will be the dominion of the computer store. In the not too distant future, Digital Equipment Corporation will discover that their computer stores are a significant profit center in their own right. When that day comes, it makes a lot of sense for the Digital Equipment Corporation computer stores to be operated as a separate division, whose business the manufacturing arm would have to compete for, along with Texas Instruments or any other manufacturer of small business systems.

It is interesting to note the **IMS Associates** manufactured IMSAI computers, as well as owning the Computerland store franchise. The manufacturing operation is now in bankruptcy, while the Computerland franchise is doing very well. Now it would be absurd to compare IMS Associates to Digital Equipment Corporation. The IMSAI computer manufacturing operation was inefficient. Nevertheless the Computerland franchise has been a massive success, even though it was formed and operated by essentially the same group of people.□

The views in this column are those of the author and are not necessarily those of the magazine or its staff. Dr. Osborne can be contacted at P.O. Box 2036, Berkeley, CA 94702.

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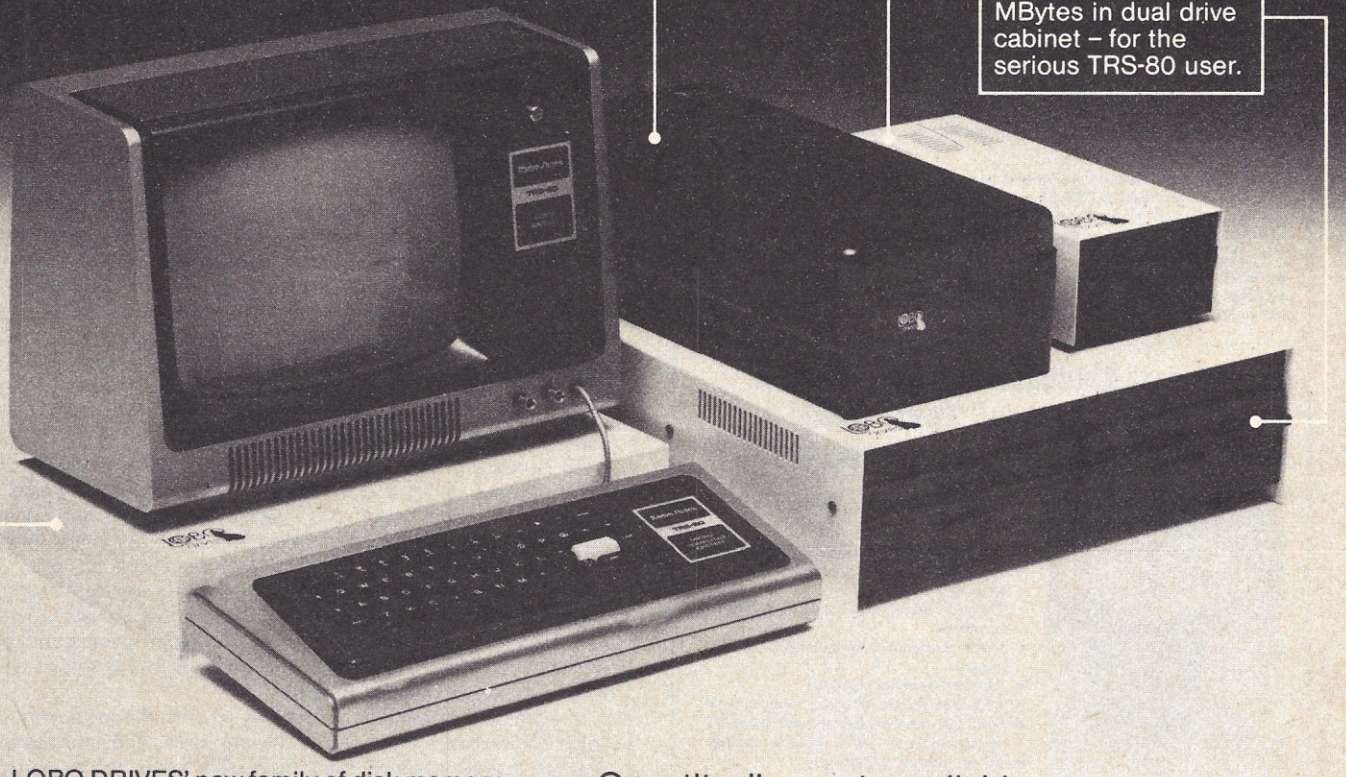

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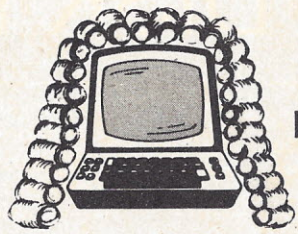

By Leonard Tachner
Attorney-at-Law

ANATOMY OF A PATENT

As alluded to last month, in future issues the format of this column will be different. In the past, this column has presented articles of a general nature on various points of law that related to the computer technology or were deemed to be of interest to computer oriented professionals, executives and hobbyists. However, beginning with the February issue, each column will discuss an issued U.S. patent on a computer-technology-related invention of possible interest to our readers. The purpose of this change is to provide a basic understanding of the contents and implications of issued U.S. patents.

The patents selected for discussion will be chosen solely on the basis of reader interest in the inventions disclosed. There will be no opinion expressed regarding the validity of the patents.

Because of column space limitations and because patents on computer-related inventions are usually lengthy, it will not be practical to publish an entire patent. However, those interested in obtaining a copy of the entire patent need only forward a request to the Commissioner of Patent and Trademarks, United States Patent and Trademark Office, Washington, D.C. 20231, identify the patent number and enclose 50 cents for each copy desired.

An issued U.S. patent gives its owner the right to exclude others from making, using and selling that invention anywhere in the United States for a period of 17 years. In return for this valuable right, the applicant for a patent must fully disclose his invention so that the public will benefit from the teachings of the patent.

The grant of a patent is only given when the applicant meets his obligations of disclosure. The application must contain a written description of the invention and of the process of making and using it in such full terms as to enable any person skilled in that particular field to make and use the invention.

In addition, the law requires that he set forth the best mode contemplated by him for carrying out his invention. The patent law also requires that the application conclude with one or more claims that particularly point out and distinctly claim the subject matter which the applicant regards as his invention. The law also specifies that when the nature of the case admits, the applicant shall furnish a drawing of his invention.

During the process of examination by the Patent Office examining corps, the application is in effect treated as if it were a working paper. The claims may be amended through correspondence between the Examiner and the patent attorney until the application is finally in form for allowance by the Patent Office.

At that time, the application becomes the issued patent. The patent is assigned a number and an official issue date which determines when the 17-year period of enforceability begins.

The following material more specifically exemplifies the contents of an issued U.S. patent. It comprises actual abbreviated portions of U.S. patent 4,136,400 which are reproduced below for illustration purposes only.

Future articles will present at least one drawing, the abstract, at least one claim, and general comments regarding the patent, if appropriate.□

For further information, contact the author at the law firm of Fischer and Tachner, 2192 Dupont Drive, Suite 210, Irvine, CA 92715.

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CIRCLE INQUIRY NO. 11

United States Patent [19]

Caswell et al.

[11] **4,136,400**

[45] **Jan. 23, 1979**

HEADING INCLUDES INVENTOR'S NAME, PATENT NUMBER AND ISSUE DATE.

[54] **MICRO-PROGRAMMABLE DATA TERMINAL** ← TITLE OF THE INVENTION

[75] **Inventors:** Robert L. Caswell, Placentia; Glen R. Griffith, Westminster, both of Calif. ← INVENTORS AND THEIR RESIDENCES

[73] **Assignee:** Rockwell International Corporation, El Segundo, Calif. ← OWNER OF PATENT

[21] **Appl. No.:** 822,769 ← SERIAL NUMBER OF APPLICATION

[22] **Filed:** Aug. 8, 1977 ← FILING DATE OF APPLICATION

[51] Int. Cl.[2] G06F 1/00

[52] U.S. Cl. 364/900

INTERNATIONAL AND U.S. CLASS OF INVENTION

[58] Field of Search ..... 364/900 MS File ← U.S. INVENTION CLASSES SEARCHED BY EXAMINER

[56] References Cited

U.S. PATENT DOCUMENTS

3,978,454 8/1976 Willard ..... 364/900 ← PRIOR ART PATENT CITED BY EXAMINER

Primary Examiner—Raulfe B. Zache

Attorney, Agent, or Firm—H. Frederick Hamann; Leonard Tachner

[57] ABSTRACT

A microprocessor based apparatus for use as a bus controller and as a remote terminal in a time-division multiplex serial data bus system. The apparatus comprises a single chip which, in a preferred embodiment, is in the form of radiation hardened LSI/ CMOS/SOS. It operates on a one bit per instruction basis. . .

NATURE AND GIST OF THE TECHNICAL DISCLOSURE FOR CURSOR INSPECTION

12 Claims, 42 Drawing Figures ← NUMBER OF CLAIMS AND FIGURES IN THIS PATENT

MICRO-PROGRAMMABLE DATA TERMINAL ← TITLE OF THE INVENTION

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates generally to data transmission in an avionics system primarily for aircraft and the like. More specifically, this invention relates to a programmable digital circuit device for use in conjunction with a time-division multiplexed data bus system.

Increasing avionics system complexity in modern military aircraft is demanding an increasing proportion of the resources. . .

STATEMENT OF THE FIELD OF ART TO WHICH THE INVENTION PERTAINS AND BRIEF DISCUSSION OF PROBLEM SOLVED BY INVENTION

SUMMARY OF THE INVENTION

The present invention is a micro-programmable data terminal (MPDT) in the form of a single, large-scale integrated (LSI) CMOS/SOS circuit chip designed to operate either as a remote terminal or as a bus controller for a time-division multiplexed data bus. No other micro-programmable single chip device capable of remote terminal and bus controller functions is known. . .

BRIEF INDICATION OF SUBSTANCE OF THE INVENTION AND WHY IT SOLVES PROBLEMS

BRIEF DESCRIPTION OF THE DRAWINGS

FIG 1 is a block diagram illustration of a typical multiplex data bus architecture.

FIG. 2 is a graphic-like illustration used to explain the data formats used in the invention. . .

BRIEF EXPLANATION OF FIGURES USED TO DESCRIBE INVENTION

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIG. 5, there is shown therein a block diagram representation of a micro-programmable data terminal chip 40 connected to a subsystem 38 and to a data bus wire pair of a time-division multiplex serial data bus 12. . .

DETAILED DESCRIPTION OF AT LEAST THE BEST MODE OF THE INVENTION (THIS IS A VERY SMALL PORTION OF A TYPICAL DESCRIPTION. THIS PATENT INCLUDED OVER 20,000 WORDS OF DESCRIPTION). MAJOR PORTION OF PATENT SPECIFICATION

SUMMARY

It will now be understood that what has been described herein is a micro-programmable data terminal for use as a bus controller and as a remote terminal in a time-division multiplex serial data bus system. The specific embodiment described. . .

CONCLUDING SUMMARY OF INVENTION EMBODIMENT DESCRIBED IN PATENT SPECIFICATION ABOVE

Having thus described a preferred embodiment of the invention, what is claimed is:

1. A single chip programmable data terminal circuit device for use in a time-division multiplex serial data bus system, comprising:

means for control of information transfer between a subsystem and said data bus, in a remote terminal mode; and

means for control of information transfer between a subsystem and said data bus, in a controller mode.

CLAIM 1 — ONE OF A NUMBER OF SINGLE SENTENCE DEFINITIONS OF WHAT INVENTOR REGARDS AS HIS INVENTION

2. A micro-programmable data terminal apparatus for interconnecting a plurality of subsystems as a remote terminal and as a bus controller in a time-division multiplex serial data bus system, said terminal apparatus comprising a unitary large scale integrated circuit chip and a memory device, said memory device being programmed to store a plurality of instructions signals and said circuit chip having circuits to address said instruction signals in accordance with the information being transferred on said data bus and to respond to said instruction signals for control of said information transfer.

CLAIM 2 — ANOTHER SUCH DEFINITION. THE CLAIMS MEASURE THE SCOPE OF PROTECTION PROVIDED BY THE PATENT.

3. A data terminal apparatus as defined in claim 2 wherein said circuit chip comprises:

a signal format conversion means for converting signals received from said data bus in a first format to signals in a second format for transfer to said subsystem and for converting signals received from said subsystem in said second format to signals in said first format for transfer to said data bus.

CLAIM 3 — STILL ANOTHER DEFINITION. THIS CLAIM IS DEPENDENT ON CLAIM 2 AND THEREFORE INCLUDES ALL OF THE ELEMENTS OF CLAIM 2 AS WELL AS THE ADDED ELEMENT

AL BAKER'S GAME CORNER

By Al Baker

IMAGINATION ROULETTE

This month we are going to toy around with the Imagination Machine from APF Electronics, Inc. The guessing game we are going to play uses one of the nicer features of this new computer — the individual player keypads.

In Imagination Roulette, the computer fills the TV screen with the digits 1 to 9. It then rapidly chooses a random digit and briefly turns it red. The players try to pick out the same digit as the computer by pushing the numbered keys on their keypads. Guessing the correct digit increases the player's score by that amount. The first player to get 50 or more points is the winner. To play another game, press the BRK key.

An obvious strategy is to always push the 9 button, since you are awarded the value of the digit for a correct answer. This problem is solved in the game by putting more of the small digits on the screen. There are a lot of 1's on the TV and only very few 9's.

Rather than give a blow-by-blow description of the game, I will point out those features which are confusing or unique to the Imagination Machine.

The routine beginning at line 1000 changes the location of the cursor on the screen. The TV screen is located in memory beginning with address 512 and ending with address 1023. Location 512 is the first position of the first line on the TV screen and location 1023 is the last position of the last line. Decide where you want to place the cursor, then assign the address within this area to the variable CU and do a GOSUB to line 1000. This routine updates the computer's cursor register at locations 40960 and 40961.

Line 400 picks out the address of a random digit on the TV screen. Its color is changed to red by adding a 64 to its ASCII value in lines 410 and 420. Line 60 is where I chose the color red. Assigning the value of 60 to the computer's hardware control register at location 8193 does the trick.

Music is played with the MUSIC statement. Briefly, the characters 1 through 7 are the first seven notes of the C major scale beginning with middle C. Placing an "*" in front of the note takes it up one octave and placing a "/" in front of the note lowers it one octave. We will spend more time with the MUSIC statement in a future column.

Here is one final trick for you to use when writing your own games. On line 270, I generate a random number between 1 and 9. The usual equation for generating integer random numbers between 1 and n is: INT (RND(1)*n)+1. Notice that on line 270 the RND function appears twice. This is a way you can generate "random" numbers which are more heavily biased toward small numbers.

For more information on the Imagination Machine, write to: APF Electronics, Inc., Department C1, 444 Madison Ave., New York, New York10022.□

Al Baker can be contacted at The Image Producers, Inc., 615 Academy Drive, Northbrook, IL 60062.

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PROGRAM LISTING (Game Corner)

```
10  REM    ...IMAGINATION ROULETTE...
20  REM
30  REM
40  REM    SET UP BLACK ON RED NUMBERS AND CLEAR SCREEN.
50  REM
60  POKE 8193,60
70  GOSUB 2000
80  REM
90  REM    DEFINE STRINGS AND SET UP MUSICAL NOTES
100  REM
110  DIM A$(1),B$(1),M$(9,2)
120  DATA 1,2,3,4,5,6,7,*1,*2
130  FOR I=1 TO 9
140  READ M$(I,0)
150  NEXT I
160  REM
170  REM    CLEAR PLAYER SCORES
180  REM
190  DIM W(2)
200 W(1)=0
210 W(2)=0
220  REM
230  REM    PLACE RANDOM DIGITS ON SCREEN
250 CU=512: GOSUB 1000
260  FOR I=1 TO 208
270  PRINT " "; INT ( RND (1)* RND (1)*9)+1;
280  NEXT I
290  REM
300  REM    PLACE PLAYER SCORES ON SCREEN
310  REM
320 CU=960: GOSUB 1000
330  PRINT "RIGHT PLAYER SCORE IS ";W(1);
340 CU=992: GOSUB 1000
350  PRINT " LEFT PLAYER SCORE IS ";W(2);
360  REM
370  REM    CHANGE COLOR OF RANDOM DIGIT AND
380  REM    GET PLAYER INPUTS
390  REM
400 I= INT ( RND (1)*208)*2+513
410 J= PEEK (I)
420  POKE I,J+64
430 A$= KEY$ (1)
440 B$= KEY$ (2)
450  REM
460  REM    SEE IF WE HAVE A WINNER
470  REM
480 K=1: GOSUB 3000
490 A$=B$:K=2: GOSUB 3000
500  REM
510  REM    RESET COLOR AND GO BACK FOR ANOTHER DIGIT
520  REM
530  POKE I,J
540  GOTO 400
970  REM
980  REM    CHANGE CURSOR LOCATION
990  REM
1000 CX= INT (CU/256)
1010 CY=CU-CX*256
1020  POKE 40960,CX
1030  POKE 40961,CY
1040  RETURN
1970  REM
1980  REM    CLEAR THE TV SCREEN
1990  REM
2000 CU=988
2010  GOSUB 1000
2020  FOR X=1 TO 16
2030  PRINT
2040  NEXT X
2050  RETURN
2940  REM
2950  REM    PLAYER INPUT ANALYSIS
2960  REM
2970  REM
2980  REM    HANDLE NO KEY PRESS OR WRONG KEY
2990  REM
3000  IF A$="" THEN  RETURN
3010  IF  ASC (A$)<>J THEN  MUSIC "/1": RETURN
3020  REM
3030  REM    CORRECT KEY PRESSED
3040  REM
3050 L=J-48
3060  MUSIC M$(L,0)
3070 W(K)=W(K)+L
3080 CU=950+K*32: GOSUB 1000
3090  PRINT W(K);
3100  IF W(K)<50 THEN  RETURN
3110  PRINT " WINNER";
3120  GOTO 3120
```

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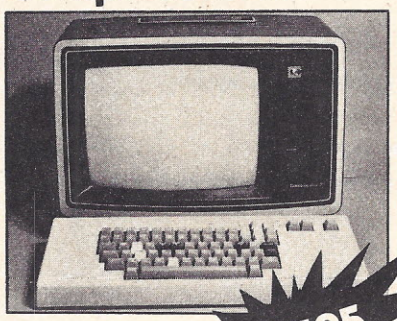

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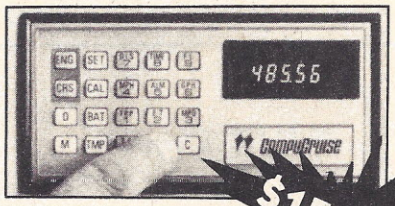

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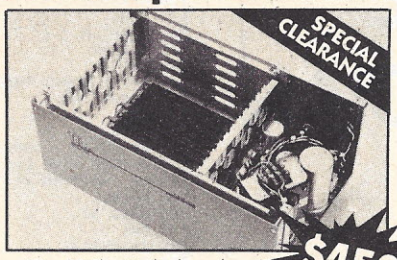

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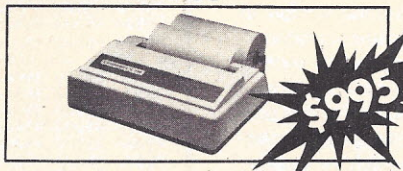

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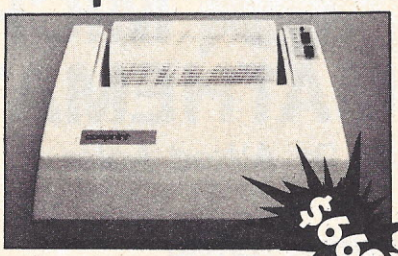

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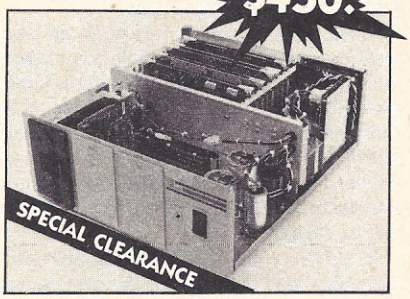

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THE MICRO-MATHEMATICIAN

By Dr. Alfred Adler

MEMORY TESTING

Having spent the last three columns discussing such heavy theoretical subjects as matrices and transcendental equations, this might be a good time to switch to a very practical subject which is rather important to all computer owners — memory testing.

How many times have you had to give a command a second time before the computer responded? How many times did something absolutely freaky happen, just once; then everything was OK again? You convince yourself that you pushed the wrong button. But did you? Did it ever occur to you that maybe it's one of your chips in RAM that's flaky, and not you? Some means of measuring the sanity of RAM is clearly required.

Memory testing really boils down to a series of POKEs, followed by PEEKs. It is best to do this in assembly language, since to do it in BASIC takes so long to run.

Godbout Electronics furnishes an assembly language memory testing routine along with their Econoram boards. However, it needs some personalization and if you don't write assembly language, you have a small problem. The monitor included with the latest North Star Disk System has an excellent memory testing routine included, but if you don't own a North Star system that doesn't help much either. These are exactly the kinds of problems that are sooner or later faced by everyone at some point in his progression from beginner to guru.

In spite of the considerable amount of time required to test memory using BASIC, it is the best approach and often the only approach available to the user who doesn't yet write assembly language. This month we present a memory test routine written in BASIC and discuss its use and some of the pitfalls encountered.

A number of convenience features were considered in the writing of Program MEMTEST. First, due to the very long running time, it was considered essential that the operator be informed of the progress of the run. The operator is otherwise sorely tempted to interrupt to see if things are progressing properly, which of course, serves also to prevent things from doing just that. Second, in order to save time, the operator should be able to test only that part of memory which is suspect. And third, a clear indication must be given of exactly which location is causing a problem, so the operator can identify the bad chip. It is also a good idea in any experiment to have a record of all the test conditions, including those whose direct affect on the outcome has not been definitely established.

Referring to the listing, statement numbers 15 and 16 provide for commentary regarding the board under test and its location as well as the identification and location of all other RAM boards in the system at test time. Statement numbers 20 and 25 specify the initial and final RAM address (in decimal) to be tested. Statement number 30 specifies (in decimal) the binary pattern to be loaded into each memory address. For example, a decimal 85 will load each RAM address with 01010101, and a decimal 170 will load each address with 10101010. Using just these patterns should smoke out most of the commonly encountered errors.

Obviously one cannot test memory that is currently being used to hold BASIC or the testing program. The memory boards must be shifted around so that each free block of memory in turn may be tested. This problem is not unique to memory testing with BASIC, as one must always skirt around the testing program even if

```
>LIST
1 REM######################################################################
2 REM
3 REM########  P R O G R A M     M E M T E S T  ########
4 REM
5 REM##############  VERSION  1.0  ####  OCTOBER  1978  ##############
6 REM
7 REM###########  WRITTEN  BY  -  ALFRED  A.  ADLER  PHD  ############
8 REM
15 INPUT"BOARD UNDER TEST AND LOCATION : ",T$
16 INPUT"OTHER BOARDS AND LOCATIONS : ",B$
20 A=40960
25 H=41550
30 N=85
32 !"A=",A," ;  ","H=",H," ;  ","N=",N
35 N(1)=N
40 C=1\D=1
42 !"THE POKED VALUE OF ALL ADDRESSES IS ",TAB(45),
45 GOSUB 100
48 J=A
50 POKE J,N
51 IF J/500 = INT(J/500) THEN !J,\C=C+1
52 IF C=6 THEN C=1\!
53 IF J=H THEN !\!"J=",J,"; ALL ADDRESSES POKED."\GOTO 58
54 J=J+1
55 GOTO 50
58 J=A
60 Z=PEEK(J)
70 X=N-Z
75 IF J/500 = INT(J/500) THEN !J,\D=D+1
76 IF D=6 THEN D=1\!
80 IF X=0 THEN 180
85 !TAB(35),J,TAB(45),
90 N(1)=Z
100 FOR K=1 TO 8
110 M=2^(8-K)
120 B(K)=INT(N(K)/M)
130 N(K+1)=N(K)-B(K)*M
140 !B(K),
150 NEXT
160 !
170 IF N(1)=N THEN 48
180 J=J+1
190 IF J=<H THEN 60
200 !\!"J=",J-1,"; ALL ADDRESSES PEEKED; RUN COMPLETED."
```

Figure 1. Listing of MEMTEST

```
>RUN

BOARD UNDER TEST AND LOCATION : 16K AT 8000/BFFF
OTHER BOARDS AND LOCATIONS : BASE 2 AT 2/4; VG AT 4/6
A= 32768 ;  H= 49151 ;  N= 85
THE POKED VALUE OF ALL ADDRESSES IS          0 1 0 1 0 1 0 1
 33000 33500 34000 34500 35000
 35500 36000 36500 37000 37500
 38000 38500 39000 39500 40000
 40500 41000 41500 42000 42500
 43000 43500 44000 44500 45000
 45500 46000 46500 47000 47500
 48000 48500 49000
J= 49151; ALL ADDRESSES POKED.
 33000 33500 34000 34500 35000
 35500 36000 36500 37000 37500
 38000 38500 39000 39500 40000
 40500 41000 41500 42000 42500
 43000 43500 44000 44500 45000
 45500 46000 46500 47000 47500
 48000 48500 49000
J= 49151; ALL ADDRESSES PEEKED; RUN COMPLETED.
>30 N=170
>RUN

BOARD UNDER TEST AND LOCATION : 16K AT 8000/BFFF
OTHER BOARDS AND LOCATIONS : BASE 2 AT 2/4; VG AT 4/6
A= 32768 ;  H= 49151 ;  N= 170
THE POKED VALUE OF ALL ADDRESSES IS          1 0 1 0 1 0 1 0
 33000 33500 34000 34500 35000
 35500 36000 36500 37000 37500
 38000 38500 39000 39500 40000
 40500 41000 41500 42000 42500
 43000 43500 44000 44500 45000
 45500 46000 46500 47000 47500
 48000 48500 49000
J= 49151; ALL ADDRESSES POKED.
 33000 33500 34000 34500 35000
 35500 36000 36500 37000 37500
 38000 38500 39000 39500 40000
 40500 41000 41500 42000 42500
 43000 43500 44000 44500 45000
 45500 46000 46500 47000 47500
 48000 48500 49000
J= 49151; ALL ADDRESSES PEEKED; RUN COMPLETED.
```

Figure 2.

assembly language is being used. The use of BASIC does make the problem considerably worse, however. Care must also be taken when testing near the top of memory.

We found in first using this program that the 22 addresses located from 26 below to 4 below the top of memory quite often, but not always, contained patterns different from those POKEd in. This would seem to indicate some sort of memory error except for the inconsistency in the pattern and the fact that no one particular chip could be pinned down as the culprit. Still more confusing was the fact that even when we changed boards the problem remained. What we hadn't thought of was that BASIC uses these locations when RUNning and therefore of course changes them continuously.

It is certainly possible to test memory addresses that are in the system if one is careful to stay above the testing program and at the same time remain clear of those few dozen locations near the very top of memory that BASIC is using. It is much better if at all possible to isolate the board or section of board being tested. This can be done by suitable settings of the on-board DIP switches.

Referring to the listing again, statement number 42 informs the operator of the binary pattern being POKEd into all addresses. The subroutine in statement numbers 100 to 150 converts decimal to binary when necessary for output. Statement numbers 51 and 52 keep the operator awake by informing him each time 500 or more addresses are POKEd, and arraying these numbers 5 to a line. Statement numbers 75 and 76 serve the same function while addresses are being PEEKed. The PEEKing takes place following statement number 58; 70 compares the PEEK to the POKE and if they are different the PEEKed value is converted to binary and printed along with the offending address. As long as no errors are found, addresses are printed every 500 and the operator is informed when the RUN is completed.

Since, as mentioned earlier, North Star has a built-in memory testing scheme, and since this program was written out of need before we had our North Star system, Program MEMTEST is, alas, written in PolyMorphic BASIC, version A00. The user who will rewrite this program into another BASIC needs to be aware of the difference between the way Poly BASIC handles an IF statement on

```
>RUN

BOARD UNDER TEST AND LOCATION : 16K AT 8/BFFF
OTHER BOARDS AND LOCATIONS : P2 AT 2/4; VG AT 4/6
A= 40000 ;  H= 49151 ;  N= 85
THE POKED VALUE OF ALL ADDRESSES IS          0 1 0 1 0 1 0 1


 40000 40500 41000 41500 42000
 42500 43000 43500 44000 44500
 45000 45500 46000 46500 47000
 47500 48000 48500 49000
J= 49151; ALL ADDRESSES POKED.
 40000 40500 41000 41500 42000


 42500                          42944     0 1 0 1 0 1 0 0
                                42945     0 1 0 1 0 1 0 0
                                42946     0 1 0 1 0 1 0 0
                                42947     0 1 0 1 0 1 0 0
                                42948     0 1 0 1 0 1 0 0
                                42949     0 1 0 1 0 1 0 0
                                42950     0 1 0 1 0 1 0 0
                                42951     0 1 0 1 0 1 0 0
                                42952     0 1 0 1 0 1 0 0
                                42953     0 1 0 1 0 1 0 0
                                42954     0 1 0 1 0 1 0 0
                                42955     0 1 0 1 0 1 0 0
                                42956     0 1 0 1 0 1 0 0
                                42957     0 1 0 1 0 1 0 0
                                42958     0 1 0 1 0 1 0 0
                                42959     0 1 0 1 0 1 0 0
                                42960     0 1 0 1 0 1 0 0
                                42961     0 1 0 1 0 1 0 0
                                42962     0 1 0 1 0 1 0 0
                                42963     0 1 0 1 0 1 0 0
                                42964     0 1 0 1 0 1 0 0
                                42965     0 1 0 1 0 1 0 0
                                42966     0 1 0 1 0 1 0 0
                                42967     0 1 0 1 0 1 0 0
                                42968     0 1 0 1 0 1 0 0
                                42969     0 1 0 1 0 1 0 0
                                42970     0 1 0 1 0 1 0 0
                                42971     0 1 0 1 0 1 0 0
                                42972     0 1 0 1 0 1 0 0
                                42973     0 1 0 1 0 1 0 0
                                42974     0 1 0 1 0 1 0 0
                                42975     0 1 0 1 0 1 0 0
                                42976     0 1 0 1 0 1 0 0
                                42977     0 1 0 1 0 1 0 0
                                42978     0 1 0 1 0 1 0 0
                                42979     0 1 0 1 0 1 0 0
                                42980     0 1 0 1 0 1 0 0
                                42981     0 1 0 1 0 1 0 0
                                42982     0 1 0 1 0 1 0 0
                                42983     0 1 0 1 0 1 0 0
                                42984     0 1 0 1 0 1 0 0
                                42985     0 1 0 1 0 1 0 0
                                42986     0 1 0 1 0 1 0 0
                                42987     0 1 0 1 0 1 0 0
                                42988     0 1 0 1 0 1 0 0
                                42989     0 1 0 1 0 1 0 0
                                42990     0 1 0 1 0 1 0 0
                                42991     0 1 0 1 0 1 0 0
                                42992     0 1 0 1 0 1 0 0
                                42993     0 1 0 1 0 1 0 0
                                42994     0 1 0 1 0 1 0 0
                                42995     0 1 0 1 0 1 0 0
                                42996     0 1 0 1 0 1 0 0
                                42997     0 1 0 1 0 1 0 0
                                42998     0 1 0 1 0 1 0 0
                                42999     0 1 0 1 0 1 0 0
 43000                          43000     0 1 0 1 0 1 0 0
                                43001     0 1 0 1 0 1 0 0
                                43002     0 1 0 1 0 1 0 0
                                43003     0 1 0 1 0 1 0 0
                                43004     0 1 0 1 0 1 0 0
                                43005     0 1 0 1 0 1 0 0
                                43006     0 1 0 1 0 1 0 0
                                43007     0 1 0 1 0 1 0 0


 43500 44000 44500
 45000 45500 46000 46500 47000
 47500 48000 48500 49000
J= 49151; ALL ADDRESSES PEEKED; RUN COMPLETED.
```

Figure 3.

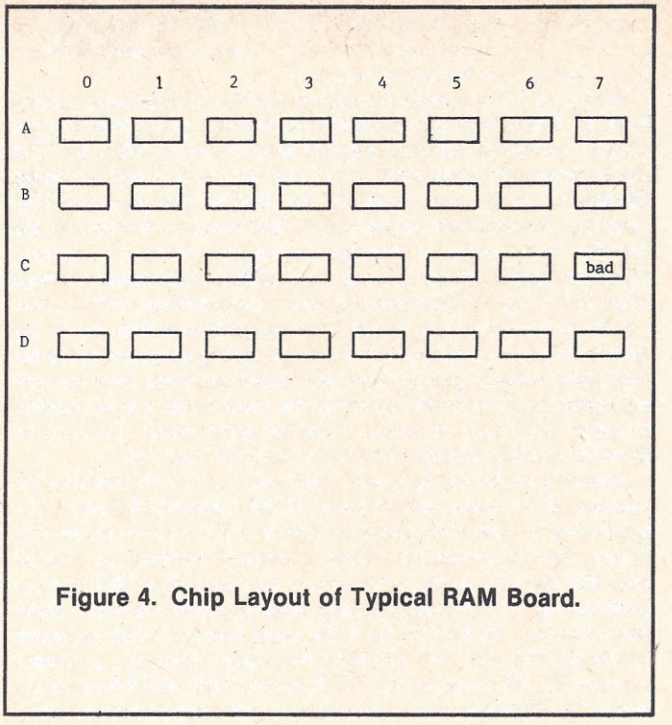


Figure 4. Chip Layout of Typical RAM Board.

a multi-statement program line and the way certain other BASICs handle it. In Poly BASIC, if the IF is not satisfied, all following statements on the same line are ignored. Certain other BASICs, including North Star, execute the remaining statements on a multi-statement line without regard to the validity of the IF statement. This affects statement numbers 51, 52, 53, 75, and 76.

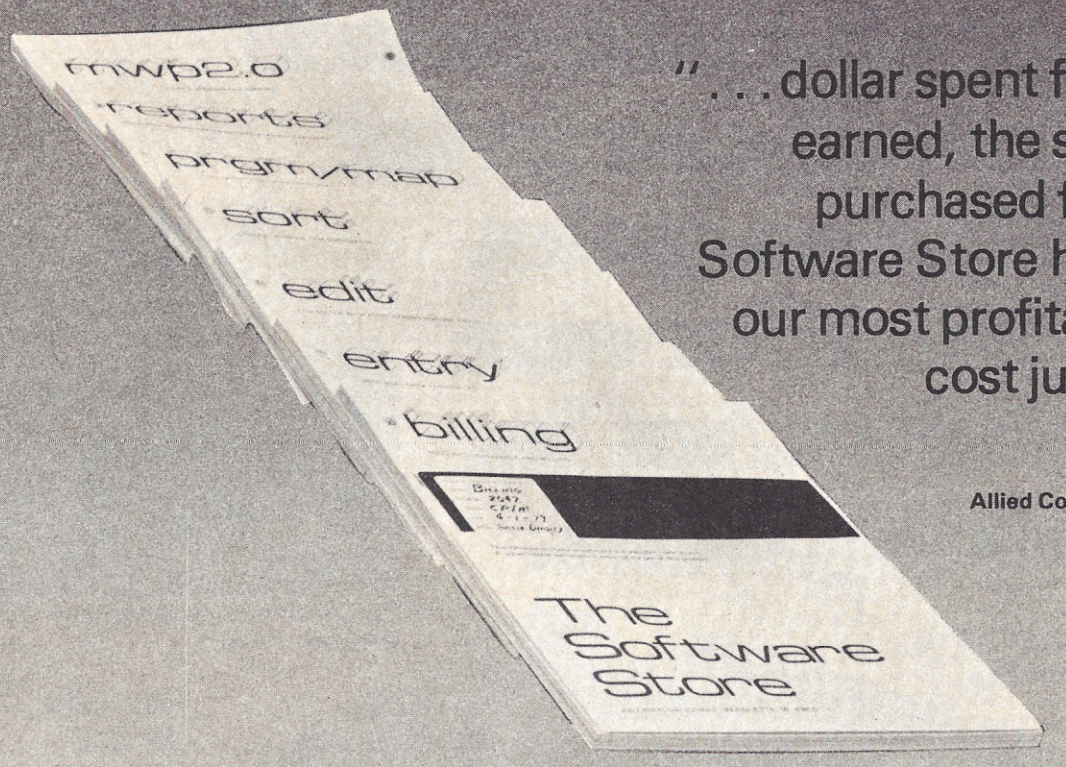
A sample run is shown in Figure 2. A 16K board was isolated from the rest of the RAM by addressing it from 8000 to BFFF, while the rest of RAM was below 6000 HEX. One run was made POKEing decimal 85 and the other made POKEing decimal 170. Note that both runs were completed without error. Another sample run is shown in Figure 3. This is the same board, isolated and addressed as before. This run was made at a later time, however, after the board was old and worn. Note that this sample run reveals an error in the eighth bit in addresses 42944 to 43007 inclusive. The program has very obligingly found our error for us in terms of machine addresses. In order to correct this error, however, we must be able to relate a machine address to a specific chip. This is not difficult to do if the architecture of the memory board is known.

Referring to Figure 4, we see the layout of the memory chips in a typical RAM board. The numbers, 0 to 7, correspond to the eight columns of chips and make us suspect that these are bit numbers. This is reinforced by the knowledge that the cheapest way to build RAM is to use a separate chip for each bit. Since we also know that this particular board is made up of chips that can store 4K bits each, we can safely surmise that the top row stores the first 4K addresses, the second row stores the second 4K addresses, and so on. Since the board was, for this test, addressed to 8000 to BFFF HEX, the first row stored 8000 to BFFF, the second row stored 9000 to 9FFF, and so on.

We are looking for the eighth bit in addresses 42944 to 43007. First of all, all eighth bits are stored in the right hand column of chips, which narrows it down to four chips. Addresses 42944 to 43007 decimal convert to A7CO to A7FF HEX. Since these are in the A000 to AFFF block, they are stored in the third row of chips. The faulty chip is therefore the right hand chip in the third row. We can even tell which addresses on the chip are bad. Since A7CO is 1984 decimal greater than A000, and since A7FF is 2047 decimal greater than A000, it follows that locations 1984 to 2047 inclusive are the bad locations on the faulty chip. That seems to narrow things down pretty well.

Next month we expect to be back in North Star BASIC and hopefully by then we can write the Fourier analysis routine.□

Contact Dr. Adler at 10360 E. Flintlock Trail, Tucson, AZ 85715.



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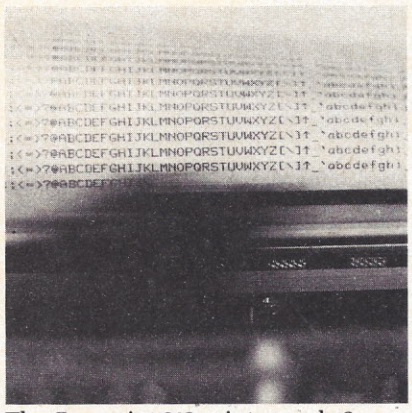

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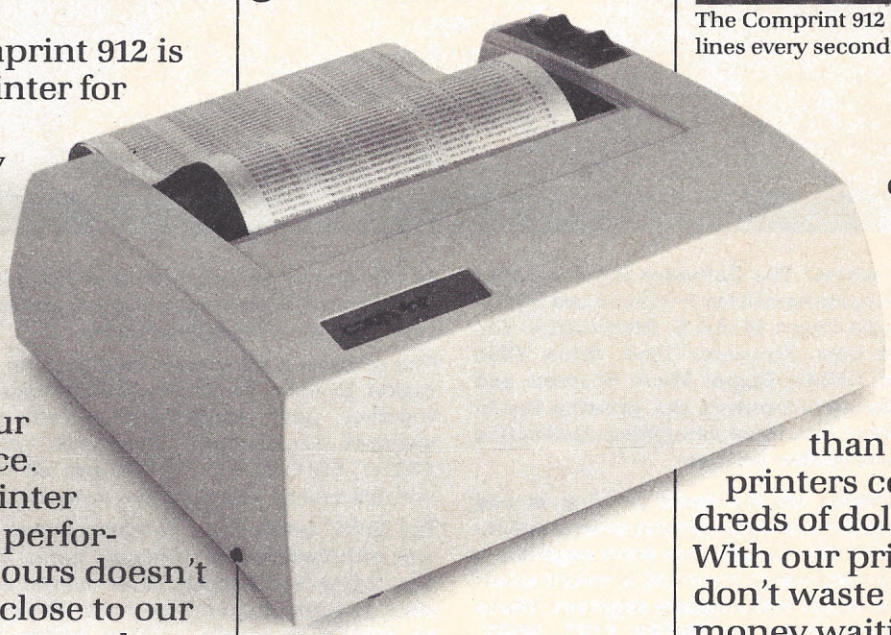

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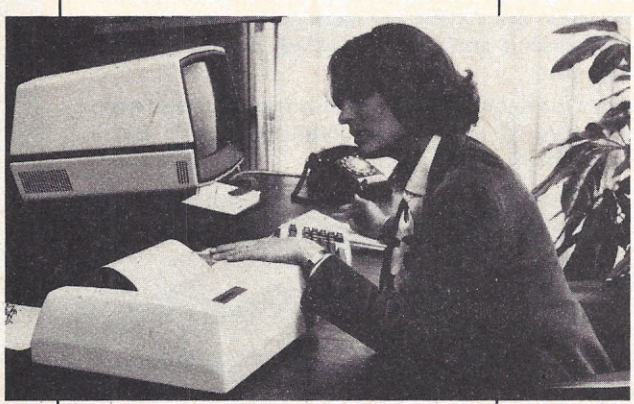

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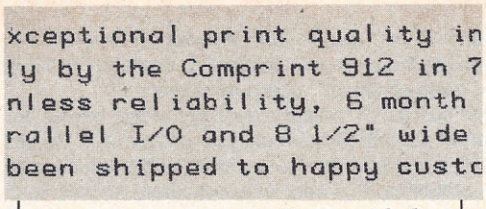

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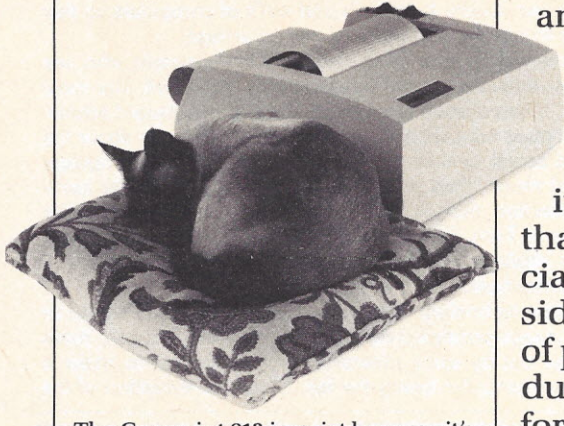

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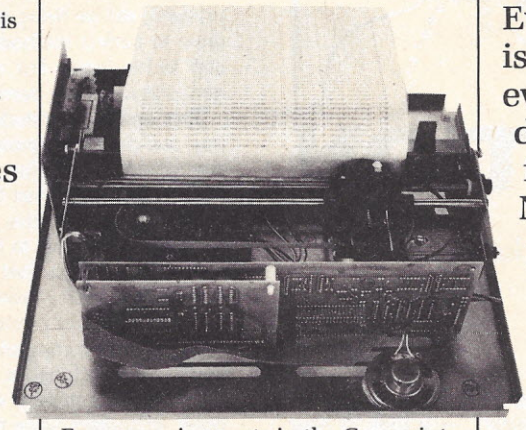

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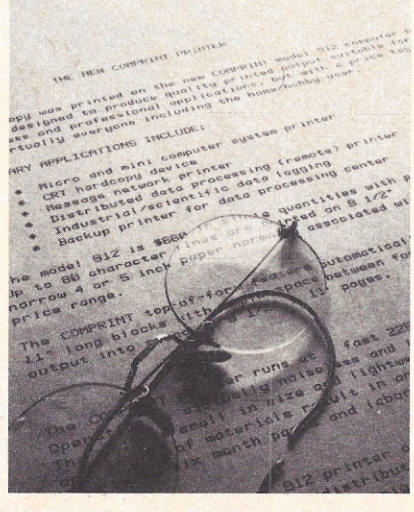

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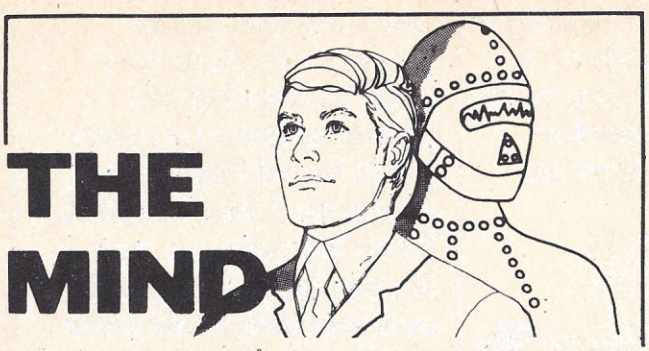


THE MIND REVOLUTION

By Merl Miller with Ed Uecker

The purpose and scope of this column has always been discussion of some future aspect of "computer behavior" — a look at how computers might be affecting our lives in the future. This month will take a departure from that line to view the problem from the other side of the fence. We will look at how people might react to the rapid growth of computer technology in our society.

To begin with, if we, as a society, are going to be able to cope with and effectively use increasingly higher levels of machine intelligence, we had better get started *now*. Because computer capabilities and applications are growing at such a phenomenal rate, we stand to lose much if we do not hasten to catch up with this technology that is already very much a part of daily life but a virtual mystery to 95% of the population. Everything about computers — from the beneficial aspects through the potential for abuse through access to private information — demands that we learn, now, how to develop and control the technology. Man, in the computer age, must learn to think further into the future as the computer brings the future into reach at an ever-accelerating pace.

We must begin now to educate the population, en masse, before John W. Public gets so far behind the technocrats that the technology is placed out of his reach and made accessible only to a computer elite. And, even if we were to begin now to educate everyone, it is doubtful we would have a society which could understand and use the computer to the fullest when machine intelligence comes of age. It is difficult to imagine, for instance, that the U.S. Congress (composed primarily of older men and growing, year-by-year, more conservative in a system that operates on seniority and tradition) could provide the innovative leadership necessary to bring our society up to "state of the art" computer literacy.

Whether society has as its primary goal gathering berries for winter or the export of durable goods makes no difference in the fact that societal growth is nurtured by the curiosity of the young who seek to solve the problems. If it were only necessary to train each new generation to pick berries, life would be simpler but we'd all probably still be living in the trees. Because of our curiosity and our drive to perfect methods and systems, many pursue the new ideas and technologies but most are satisfied to simply train the next generation to pick berries, get by and "don't rock the boat."

This apathetic attitude could spell genuine trouble for us in the next two decades. Ignorance, in so far as the computer technology is concerned, is not bliss. It seems to be a problem a hundred times more widespread than illiteracy is today.

In order to avert this potential "computer illiteracy" disaster, the population is going to have to be educated to what computers are and are not. To say that the population will have to be educated very soon would be to ignore the fact that we are already late in entering this new phase of human awareness.

Once a basic computer literacy is achieved in society, the adaptation to new work habits, more leisure, less "busy" work and a more complex environment will be far simpler than it would be if computer technology were to arrive at its full potential today. The reality we must all face is one in which we become aware of the affect computers will have on the future and then prepare ourselves and our children to deal with and survive in that future.

With this kind of looking ahead, we can begin to plan the direction of intellectual and social eduation *now*. Instead of following the standard "knee jerk" reaction of an educational system which bases its programs on the known commodities of the past, we must begin to educate in terms of the potential of the future. Quite simply, we must educate our society to the in's and out's of computers so that we can learn to use the computer to our advantage.

None of this will be easy. The resistance from people who see computers as unnecessary and threatening is great and, like most forms of fear, is based upon ignorance. The first step toward achieving any such mass educational goal is to educate people about the potential and actual benefits of computers to society. Computers have received much "bad press" as the result of things like computerized collection notices and TV talk show hosts who holler about how every Tom, Dick and Harry has access to your personal life, business dealings and college transcripts stored in some evil computer, somewhere.

Like any other technology devised by man, however, the good or evil done is always prompted not by some sinister electronic brain on a rampage but by some enterprising character out to make a buck, with the computer taking the fall. Since the inception of the

computer, this kind of public revulsion has plagued inventors, scientists and philosophers in their efforts to get the general public to realize what a magnificent tool it can be.

The pro-computer rationale has seldom been stated more eloquently than it was by Dr. Joseph Wizenbaum in his article, "On the Impact of the Computer on Society," in the May 12, 1972 issue of *Science*:

> "I've spoken of some potentially dangerous effects of present computing trends. Is there nothing positive to be said? Yes, but it must be said with caution. Again, side effects are more important than direct effects. In particular, the idea of computation and of programming languages is beginning to become an important metaphor which, in the long run, may well prove to be responsible for paradigm shifts in many fields. Most of the common sense paradigms in terms of which much of mankind interprets the phenomena of the everyday world, both physical and social, are still deeply rooted in fundamentally mechanistic metaphors. . .Languages capable of describing on-going processes, particularly in terms of modular subprocesses, have already had an enormous affect on the way computer people think of every aspect of their worlds, not merely those directly related to their work. . .Computer simulation of social processes has already been advanced by singleminded generalists as leading to general solutions of all of mankind's problems.
>
> The metaphors given us by religion, the poets and by thinkers like Darwin, Newton, Freud and Einstein have rather quickly penetrated to the language of ordinary people. . .The computer metaphor is as yet available to only an extremely small set of people. Its acquisition and internalization, hopefully as only one of many ways to see the world, seem to require experience in program composition, a kind of computing literacy. Perhaps such literacy will become very widespread in the advanced societal sectors of the advanced countries. But, should it become a dominant mode of thinking and restricted to certain social classes, it will prove not merely repressive in the ordinary sense, but an enormously divisive societal force. For then classes which do and do not have access to the metaphor will, in an important sense, lose their ability to communicate with one another. We know already how difficult it is for the poor and the oppressed to communicate with the rest of the society in which they are embedded. We know how difficult it is for the world of science to communicate with that of the arts and of the humanities. In both instances the communications difficulties, which have grave consequences, are very largely due to the fact that the respective communities have unsharable experiences out of which unsharable metaphors have grown.

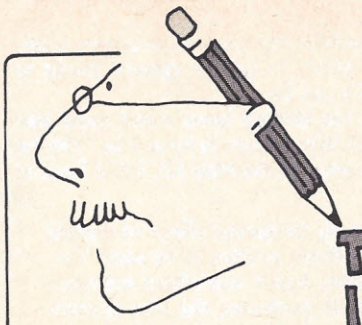
Resistance from people who see computers as threatening is great, and is based on ignorance.

Anyone seriously interested in an in-depth look at computer potential would be well advised to pick up and read everything Dr. Wizenbaum has written.

But, even now, as we have a handle on the problem how do we go about setting the wheels in motion to get the educational process geared toward computer literacy as the "Fourth R" in our schools? And the question "Can everybody learn to use a computer?" has not been answered. You and I might find it simple enough, but consider the fate of the "new math" in our schools — a failure due largely to the fact that the instructors were unable to design methods for teaching this whole new ball game. Would it be the same with computers? Should computer courses be required in elementary schools? Should a basic sequence of computer courses be required for all graduates from all colleges? Certainly, we must ask ourselves to what degree must the general public be educated.

These are elementary questions but they must be answered very soon. The failure of our society to recognize and integrate this technology into their intellectual scope may not seem too grave a concern to many at this point in time, but it could well be a critical blind spot that denies millions participation in the future.□

If you have any opinions, ideas or suggestions relating to the theme of this column, contact Merl Miller at 30 N.W. 23rd Place, Portland, OR 97210.



THE INVENTOR'S SKETCHPAD

By Roger Garrett
Contributing Editor

A SUPERCOMPUTER

I have recently been considering the future of computer technology, attempting to identify what technological changes will result in the most important advancements. After tossing around several ideas I settled on one which, in my opinion, will have the most impact. It is *increasing the processing power of computers.* Now that may seem like a fairly obvious and simplistic view, but *doing* it is another matter entirely.

The most obvious approach is to increase the speed of both the processor and memory. The problem here is that there is an upper limit to the speed at which any electrical device can be operated: the speed of light. Although the speed of light may seem like an unapproachable goal, there are some sophisticated processors in which that limit is actually becoming an obstacle.

A partial solution has been to shorten the distance which the electricity has to travel, packing the components closer and closer together and packing more circuits on each chip. Yet this is only a stop-gap solution. The limit is still there; only so many circuits can be packed into a given space.

We must ultimately look elsewhere to provide the increased processing power which will mark the next computer revolution. We must look to *multi-processing.* This has been around for quite a few years. Essentially a multi-processor is a complete system with more than one central processor, each capable of accessing (at least some portion of) a common memory.

In this way, several tasks (programs) may be executed at exactly the same time. If two tasks are running at the same time, each utilizing its own processor unit (no longer considered a *central* processor) then the speed of processing is nearly doubled. I say nearly because there are always unavoidable timing clashes when both tasks want to access the same piece of data, but careful programming can often avoid or at least reduce this lost time.

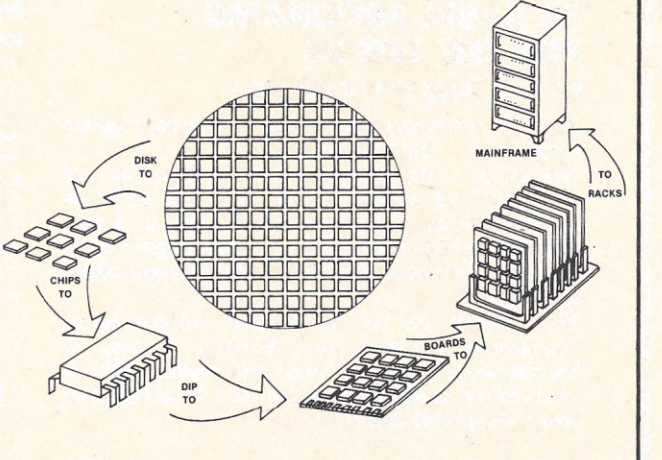


Figure 1.

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CIRCLE INQUIRY NO. 47

As we add more and more processors to a system, the number of tasks which can be executed at the same time proportionally increases the computer's overall power. So why don't we see more multi-processing systems? The simple answer is cost.

Most computers now being produced start with a large crystal of silicon which is sliced into round, highly-polished flat disks. Through a photographic process, the circuitry for a large number of identical components is deposited on the disk. One such disk might contain memory devices, another might contain central processors, and so on.

The disk is then cut up into the individual squares containing one component each. Each such *chip* is then mounted inside a plastic package called a *DIP* (Dual In-line Package) which has metal connectors (pins) between the chip itself and the outside of the DIP. An appropriate set of DIPs is then mounted on computer *boards* (also called cards); a set of boards is mounted in racks; and a set of racks is mounted in a mainframe to produce the finished computer.

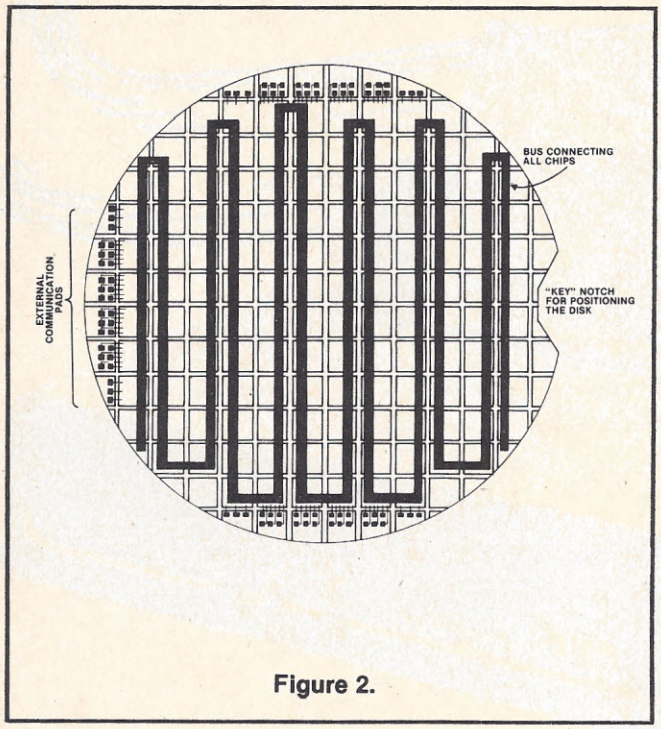


Figure 2.

All of this just for one central processing computer. Much of this sequence must be duplicated for each additional processes added to a multi-processing computer. It is no wonder that they cost so much. Can there possibly be a way to cut the cost? Certainly. Simply eliminate most of the above sequence.

Let's take a closer look at an individual silicon disk. The one pictured here has 127 active circuit areas, shown as squares. The partial squares around the edge are not active (i.e. they are not part of the multi-processing system) but some are used for other purposes.

Now this is not a conventional disk. Instead of photo-etching each square with an identical circuit (such as all memories or all CPUs) we photo-etch an entire multi-processing system on one disk. Some squares are memory devices (RAM or ROM), others are processors, and still others are interface/communications devices. *Everything* is on one silicon disk.

A set of metal bus lines traverses the entire set of squares providing communications between CPUs, memory, and interfaces. Around the edges of the disk are placed metal external communications pads. These provide places to connect the power supply lines and the communications lines so that we (the users) can communicate with the computer.

Each device on the disk would have an automatic self-checking system which would lock itself out from the overall system if it detected errors (such as improperly photo-etched circuits).

What we have then is a complete multi-processing system on one disk. And look at all of the production steps that have been reduced or eliminated. The cost saving should be phenomenal.

Now let's envision a very over-simplified package for our multiprocessor. The disk is going to require some form of interface to the outside world so we need an interface/power supply unit which fits over the top surface of the disk and makes electrical contact with the metal pads on its periphery. Notice that it requires very few input/output cables. Since there is mass RAM memory on board the computer, there is relatively little need for external sources of memory such as tapes, hard disks, floppy disks, and so forth. Most I/O requirements are for communications with human operators via terminals and with control and feedback devices such as motors and sense switches. All of these are relatively slow devices and can operate on fewer I/O lines than would be required for, say, a disk drive.

If you have ever touched a microprocessor or memory chip while a computer is running you will know that they produce quite a bit of heat; hence the fans and other cooling devices utilized on most computers. Because our multi-processor disk has well over one hundreds times that many heat-generating devices in a relatively small area, it will require a powerful cooling unit to prevent its own micro-meltdown. Since the power supply/interface unit covers the top of the disk, we attach the cooling unit firmly to the bottom surface.

The cooling device shown here is quite small; it undoubtedly would require a larger, more sophisticated system. Yet the reduced cost of constructing the computer itself should more than offset the additional cost of the cooling unit.

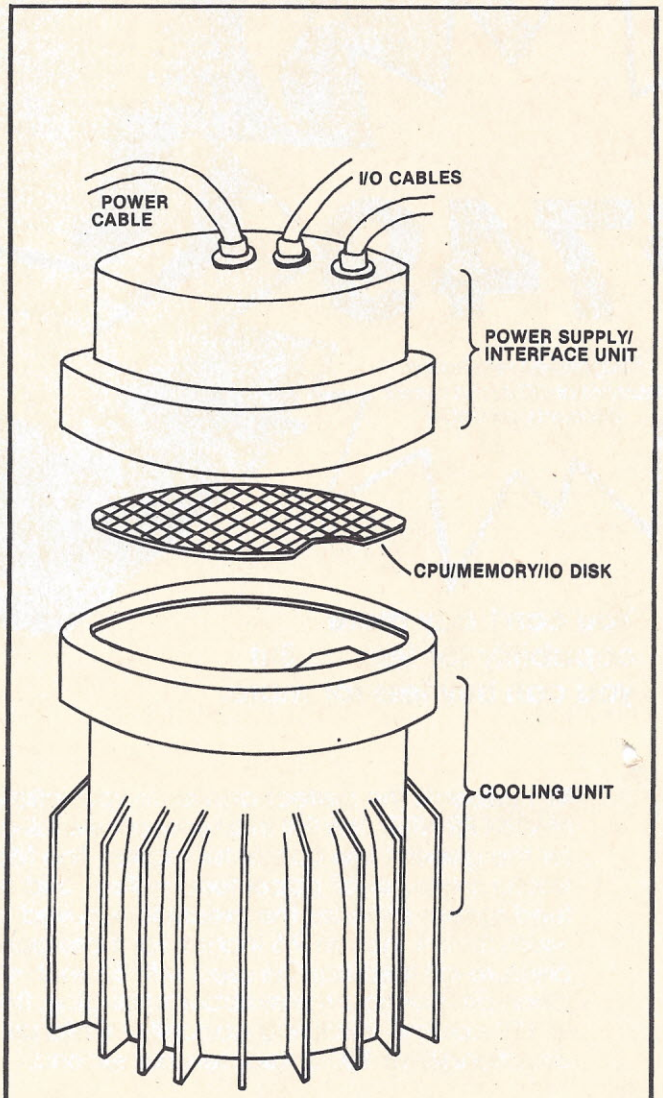


Figure 3.

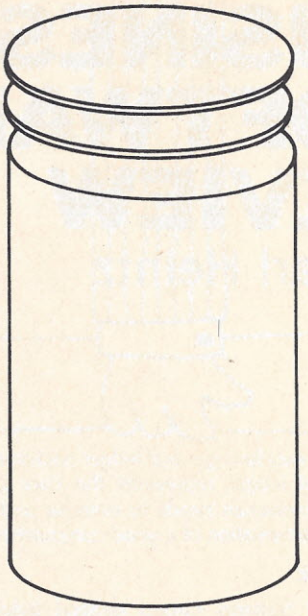


Figure 4.

Now let's step back for a moment and reconsider how that circular disk is initially made. They start with a cylindrical crystal and cut slices through it as shown here. This gives a surface area for each disk equal to the well-known formula $\pi * R^2$ where R is the radius. Now the radius of each cylinder is fairly standard. It has proven difficult to produce crystals with radii much larger than about three inches. But the length of the cylinder is merely a function of how long they allow the crystal to grow. So. . .

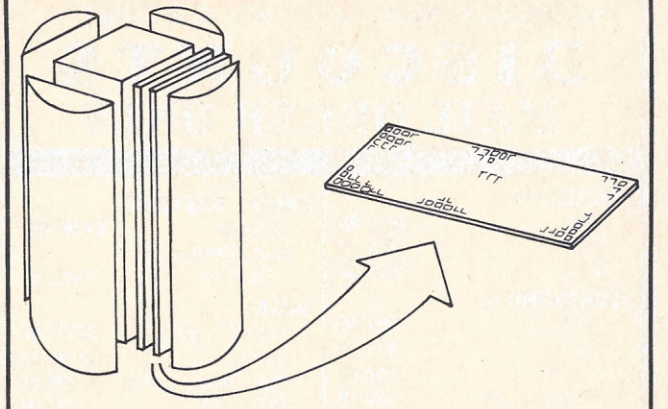


Figure 5.

Suppose we cut the crystals like this. There is some waste around the edge but look at the increased area on the disk. The *disks* are now actually rectangles. The increased surface area means a great increase in the number of devices (RAM, I/O, processors, etc.) which it can accommodate. With that increase goes an additional decrease in the cost per processor for multi-processing systems and a proportional increase in its processing power.

Now further suppose that we duplicate the computer on the bottom surface of the rectangle and thereby provide system redundancy. If a device on the top surface fails it automatically switches to its corresponding unit on the bottom.

Is all of this possible? Can it be done reliably and at a low enough cost? Let's hope so, for if it can we will see a new computer revolution. The tool for artificial intelligence will have arrived.□

Contact Roger Garrett at Inventor's Sketchpad, 16 Grinnell Street, Jamestown, RI 02835.

BUSINESS SOFTWARE REVIEW

By Carl Heintz

This month, an excellent general ledger package will be reviewed. Since the general ledger represents the core of an accounting package, the businessman needs to exercise particular care in the selection and implementation of a good computerized general ledger.

THE PACKAGE

The Structured Systems Group general ledger programs are designed to operate using the CP/M operating system. The potential user must purchase this operating system (a whole series of programs) separately, and after configuring them in the system, the SSG general ledger can be set up.

In addition, a language must be purchased and configured. In the case of the SSG programs, the CBASIC language is utilized. This configuration makes the SSG programs compatible with a wide number of computers utilizing 8080 or Z-80 microprocessors.

The programs are classically micro-oriented. This means that as a user signs on, he "boots up" the operating system, and then chooses a program to run. The program runs, does its thing and then returns the user to the operating system level. This is unlike many programs which stay in the applications mode until the processing is finished. They "chain" from one program to another, and in many cases utilize a common menu program as sort of a common entry and exit point from programs.

The SSG systems do not do this sort of "chaining" between different functions, although there is chaining of sorts within the program itself. While this leaves the operator more flexibility, it does take longer to run an accounting cycle, since each time the operator wants to run a program, he must wait while the computer loads the basic interpreter (CBASIC command "CRUN") and the program, and finally, the data.

The programs themselves occupy about 150K of space on a Micropolis disk, which is what I used to evaluate the system. That's a lot of code, especially when you consider that the programs are sold in intermediate form, which means that they have been already crunched and condensed from the source code. (For those who may be somewhat lost — a basic interpreter like CBASIC does the job of converting the human-intelligible source code into machine language in two separate steps — once to an intermediate code, and finally, upon execution, into machine language. Such a process is also known as "pseudo-compiling" and is utilized because it is faster, more efficient, and gives the author some security over the program.)

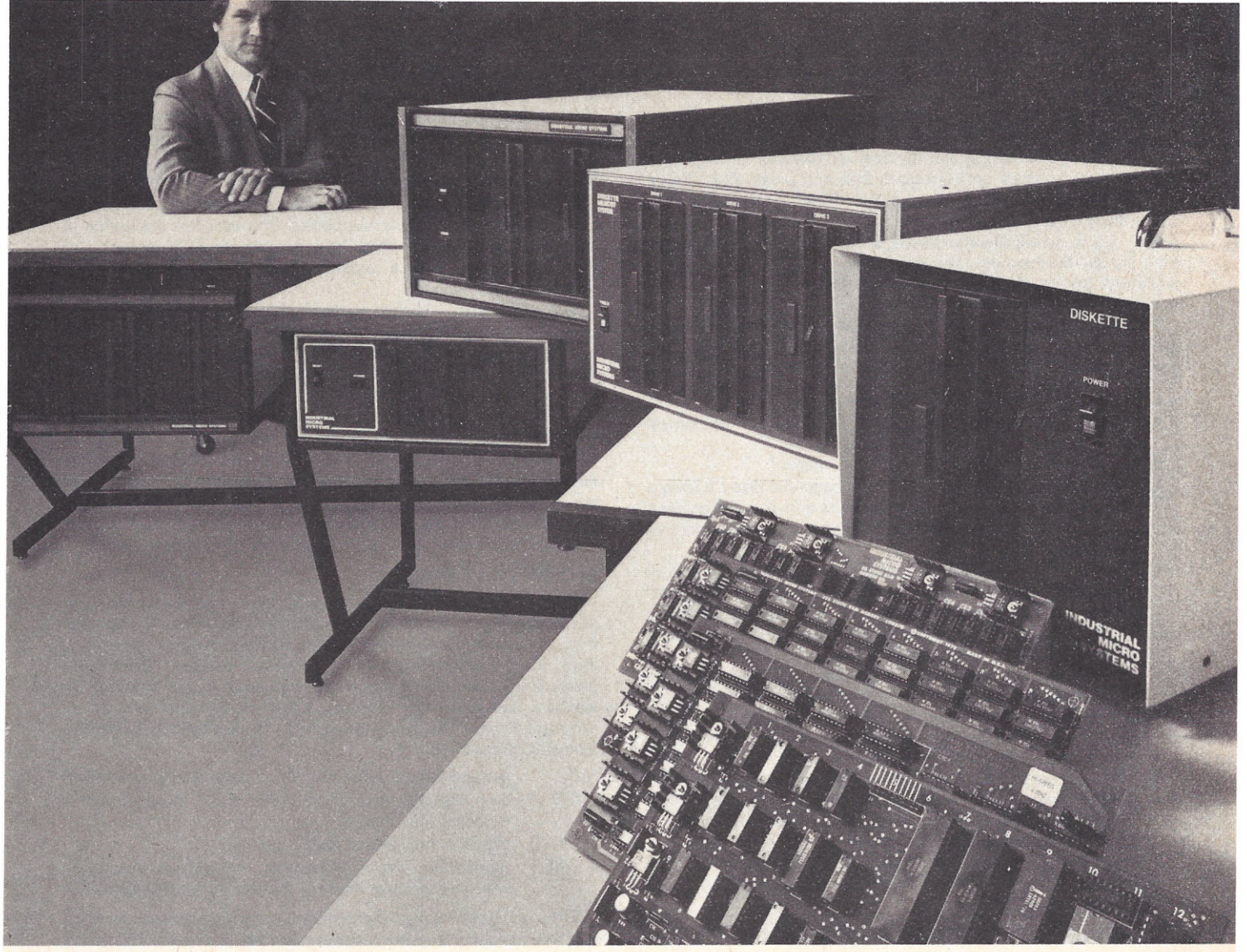
STATS ON OPERATION

The program needs 48K of RAM memory to run, must have a two-drive floppy system, and requires a 132-column printer to run. To explain the flow and use of the system, a 130-page book and a 20-page operator's manual (very helpful) are supplied.

SETTING THE SYSTEM UP

To operate the system, one must first "SYSGEN" the system disk supplied by SSG. Unfortunately, the SSG people assumed that the user is sophisticated enough to perform this task, and has the knowledge of the CP/M system to know which of the operating system programs must be placed on the general ledger disk.

To the uninitiated, this can be somewhat confusing, since the CP/M operating system consists of a number of separate programs.



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CIRCLE INQUIRY NO. 31

In other words, the user must use some discretion in knowing which operating system programs should be copied onto the general ledger program disk.

Once you have CP/M set up and ready to go, you can start getting your ledger system in order. The SSG programmers had enough foresight to realize that the best architecture for a general ledger system is based on a program disk and a data disk. Never shall the two be merged. This separation allows for the same programs to be used on a number of clients — so a CPA can use one system disk to handle literally dozens of clients. This is a feature that even the one-business user should look for, since it allows for future expansion into multiple branches, or subsidiaries (every small businessman should at least consider these).

To begin the processing on the computer, some parameters must be established. These parameters are entered via the "PARENTRY" program which asks the following questions:

1. Company name (up to 60 characters)
2. Do you want it printed in "S P R E A D O U T" fashion on the income statement and balance sheet?
3. Will the financials be on 8½" or 14" paper?
4. Will you use continuous forms, or a page at a time? (Using a page at a time, the computer stops at the end of each page and asks the user via a console command to place a new piece of paper in.)
5. Break up the income statement? (This option basically puts all of the detail for the income statement on a separate page and places just the summary headings on the statement itself.)
6. Dollars only, or dollars & cents? (Very useful option since on a complex statement the cents can be annoying.)
7. Print supporting schedules? Supporting schedules basically contain all of the detail of the statement amounts. So, for example, if three bank accounts were combined on the statement as "cash," the supporting schedule would give a detail of the balances of each.
8. What names to use for statement titles, and certain subtotals? The program allows the finicky to change the name of "balance sheet" and "income statement" to whatever they wish (this is of importance to CPAs) and allows some of the subtotals in the statements themselves to be changed.
9. Are branches or multiple profit centers used? If so, parameters are set up.

CHARTING THE CHART OF ACCOUNTS

After the parameters are established, the user is returned to his operating system level, and he can then proceed to run the program which will determine what the financial statements look like and will largely set the architecture for the accounting system. The "COAENTRY" program allows the user to specify the chart of accounts that is to be used for the accounting system with the following parameters:

1. Up to a four-digit account number, with up to a two-digit department number (department numbers are not allowed for the balance sheet).
2. Account names can have up to 30 characters.
3. The following scheme must be used for naming accounts:
   0000-0999 Asset
   1000-1999 Liabilities
   2000-2999 Capital
   3000-3599 Revenues
   3600-3999 Cost of Goods Sold
   4000-4999 Expenses
   5000-5999 Income Taxes
   Note that these assignments are mandatory. This will cause some degree of difficulty, as will be further explained below.

The chart of accounts is intimately linked with the production of the financial statements. The names of accounts will appear on the financials unless some clever manipulating of account number assignments is made. It should also be pointed out that the schema of account number assignments as used above may not be suitable for regulated industries, such as trucking or health care (in the health care industry, for example, several states require adherence to a set chart of accounts).

As mentioned, the user must be very careful in structuring his chart of accounts if he wishes to have presentable financial statements. In general, without going into excruciating detail, there are two kinds of accounts — title accounts and balance accounts. The system will not allow a user to set up a title account into which balances are placed. In general, any account number which ends in a 0 is a title account. This scheme limits the user to no more than nine balance accounts to each grouping total. While this may seem to be a lot, in the income statement particularly, it can be a problem. The programmers could have sidestepped this whole sticky wicket had they used a formatting program (somewhat like a word processor).

It was mentioned that the chart of accounts will support multiple profit centers — 96 can be supported. The user has the option of setting up profit centers which have no separate G&A accounts or branches, which have a separate "expense" section for each revenue department.

The entry of the chart of accounts through the "COAENTRY" program goes quite quickly. It is possible to omit certain accounts and the computer will recognize their necessity and "autogenerate" them. This process applies mainly to title accounts, of course, since although the program is "intelligent" it isn't an accountant.

When we discussed the chart structure above, readers may have wondered how in the world to get the statements to look like you want them to. Visions of changing a chart of accounts with real, live data are horrifying to an accountant. Someone at SSG must have realized that, and made provisions for a "dummy" balance sheet and income statement so that the user has an idea of how the financials will look before the chart of accounts is "set in concrete."

ENTER THAT DATA

SSG's general ledger system is designed to be implemented with accompanying packages for receivables and payables. Accordingly, it has a somewhat limited entry system contained within the package itself. Journal entries made by the "journal" program. Completely menu driven, the journal program is a pleasure to use, since the interactive nature of the programs helps prompt the user at appropriate times. The first menu which is displayed presents the following alternatives:

GJ	general journal (mode in which most data is processed)
CD	cash disbursements (a variation of GJ in which check numbers are entered)
DATE	Where a new period date is entered
END	Signals the end of processing, and triggers a program which determines whether the entries are in balance.

Entry of data into the journal program is done by account number. Lest that create errors, the program searches the chart of accounts for each account number entered, displaying the account name before any data is entered. Accounting data is generally entered as either a debit or a credit, which can be roughly equated to a positive and negative number arrangement. This is denoted by "D" and "C" rather than plus (+) and minus (—), leaving a point of confusion for unwary users.

When we initially started making journal entries to the system, we came across a reference to a "special function key." Since the terminal we were using had no special function keys (after checking it out twice) we looked in the instructions, and there is a chapter which discusses what the term "special function" means. There are eight special functions:

1. Duplicate the last entry
2. Change check number (used for entering cash disbursements)
3. Display the contents of a user "accumulator"
4. Clear a "user accumulator"
5. Skip a field
6. Cancel the transaction
7. Stop the routine
8. Start/stop holding a check number (used to have one check number for a number of accounts)

Any terminal with an escape key can be used to generate "special function key" operation. The operator merely hits the "escape" key and then a number key corresponding to the "special function." Clever and it works. It is difficult to fully appreciate the usefulness of these special functions without having used them. Consider the repeat key, which lets one repeat a journal explanation without having to re-type it. A very useful and time-saving mechanism.

At any time during the journalizing process, the user can stop and examine the input on a line-item basis. This is useful for proofing. Once data has been input, and the "end" function selected, a balance will be attempted by the computer. If the debits do not equal

the credits, a display will indicate the difference. Of course, it is up to the user to find it. Note that it is possible to make one-sided journal entries.

POSTING THE DATA

Once the data has been proofed, and shown to be in balance, a posting to the general ledger can be accomplished. One weakness in this process is the absence of any hard-copy of exactly what was posted and what wasn't — the SSG manual suggests that a batch copy be retained for this purpose. However, this poses a significant control weakness, since there are no mechanisms to insure that the batch print-out you have is the same as that which was posted. In the hands of a knowledgeable user, however, this discussion becomes somewhat academic.

BALANCE THE TRIAL BALANCE

After data has been posted, a program which generates a trial balance can be run. This report has the format of beginning balance, debit, credit, and ending balance. It is useful in that it demonstrates to the user what the changes in accounts are. However, it does not indicate what the profit and loss is, nor does it separate balance sheet from income statement accounts. On balance, however, the report is well constructed, and useful.

Closing is the process by which the data entered during posting is summarized and totals entered into the general ledger summary files. This process is irrevocable without tremendous effort, and so the user is cautioned to be sure everything is in order. From the standpoint of making "post closing" entries, the SSG system is deficient. There are no provisions to allow for entries which affect other periods only (such as a correction of a prior month's journal entries) and this absence represents a significant weakness in the system.

PRETTY FINANCIALS

The SSG financial statements are produced in an eye-pleasing format which makes for easy presentation to clients or the bank. The system has provisions for a disclaimer to be placed at the bottom of the statements, so a CPA can have his usual "unaudited" caution there.

In balance, the financials presented by the SSG programs are very well laid out if the user has done his job correctly.

ERRORS, SOURCE CODE AND OTHERS

The SSG general ledger comes in a form which basically makes it impossible for the average user to access or utilize the source code. Thus the system is, for all intents and purposes, not subject to modification.

Error messages are handled well in the SSG manual — there is a whole section devoted to them. While they are not explained in as much depth and scope as say the CCA data management system (the premiere program for handling errors), which was recently reviewed in this column, the general ledger is fairly comprehensive.

The SSG programmers put a special section in the manual concerning the layout of the files as an aid to programmers who wished to interface with the system. While I had no use for the section as a user, it was nonetheless reassuring to know that the documentation was at hand.

CONCLUSION

The SSG general ledger package represents an excellent piece of software. While it is expensive, it provides the user with something which can be depended upon to perform reliably. Sufficient flexibility is in the system to allow for adaptation to a wide range of industries and specific applications.

LET'S HEAR YOUR CONCLUSIONS

Do you have a particular piece of software which you would like reviewed? We would like to hear about it. Have you experienced good or bad results from software reviewed in this column? If so, let us know so that we may pass it on to our readers.□

Software vendors who are interested in having their product reviewed can contact Carl Heintz at 41 West Santa Clara, Arcadia, California 91006.

Micro Mixdown

There's a 65K Helper in the Recording Studio

By Steven L. Martin

Making a recording is a complex and curious process, in that it involves the interaction and play, and ultimately the blending of diverse things: an artist's talent and style, a producer's judgement, the experience and skill of a recording engineer, and the performance and capability of recording apparatus. While talents vary and styles change and the judgement of producers is good or bad, improvement and progress are the real domain of the recording engineer and the equipment with which he does his job. Computers are now entering this field, improving recording quality.

Let us consider for a moment the process of making a studio recording. The process can be divided into two main activities: the recording session and the mixdown. The purpose of the recording session is to record it in a special way. The musicians are placed in a room so that each can be recorded onto separate tracks of a multi-track recording tape (24 track, 2" tape is typical in the larger studios). Since baffles may be used and musicians may be placed in an unaccustomed arrangement, a cue system (headphone set through which the entire group is heard, remixed and blended especially for feedback purposes) is usually employed.

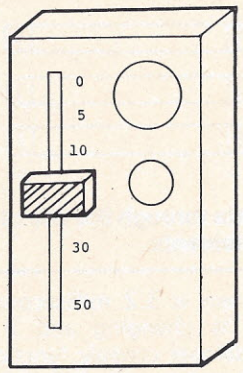
From this session a tape is then produced with a separate track for each musician (or group of musicians). Some "bleed through" occurs, of course, and is even considered desirable. Balances are roughly set, but the real emphasis is on obtaining a good clear signal from each musician and recording it on a single channel of the multi-track tape.

In the mixdown, the channels of the multi-track tape are then processed (amplified, equalized, etc., through the various console functions) and assigned as inputs to one or any number of the specified output channels. (For mono recording, there is one output channel; for stereo, there are two; for quad, four.) While the first session produces a tape that contains the raw musical material, it is the mixdown session that essentially produces the final musical product. For the producer and recording engineer, this is a crucial and often time-consuming process.

Until recently, the main tool of the mixdown has been a manually-manipulated board of knobs, switches, dials, settings and buttons. But with the aid of computers, a producer's manual work can be retained so the best portions of several different mixes can be combined for the master record.

In essence, for mixdown purposes in most larger studios the board is a 24-inch/4, 2 or 1 out system that provides independent amplitude control, equalization (shaping of the frequency spectrum), panning (dynamic control of the % of

the signal going to each output channel), group assignment, etc., for each of the 24 input channels. In addition, group and master controls are provided. The most commonly-manipulated characteristic of an input channel is its amplitude, and this is accomplished by means of a linear motion gain selector, called a fader.



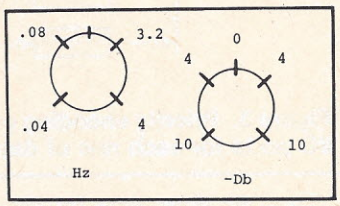


Figure 1. A linear motion fader (left) and mid-range EQ control dials.

Panning is controlled by twist-type knobs (quad uses either two or a "joystick"); equalization by setting the amplitudes of a discrete set of selected frequencies.

Now with amplitude, equalization (assuming 4 sets of frequencies and their gains are selected per channel), and panning (stereo), there are 240 settings or functions whose status the system must know at any point in time.

This system not only saves time, but it remembers what the recording engineer did the time before, letting him improve upon it. Small computer technology helps produce a better, finer mix.

There are several systems available on the market. Rupert Neve Inc.'s NECAM and the Allison Research machines appear to be the leaders in the field. This discussion will concern itself with the first and second generation Allison systems. At the heart of the Allison systems is a Zilog Z-80 chip.

Basically, all automation equipment for mixing operates in three modes: write, read, and update. In write mode, the status of the various console functions are scanned, encoded into a digital (or digital-type) format, and written on tape (usually a blank channel of the multi-track audio tape).

In read mode, data encoded on the tape is decoded and sent to the appropriate functions on the console, which are now controlled by the decoded data.

In update mode, previous data can be altered by manual manipulation of the console. (For write mode, selected functions can be chosen to be rewritten, while the data for other functions remains unaffected.) Thus mixing can become a process of refinement and nuance.

The first generation Allison system (the Allison Model 256 Programmer) was designed to operate in conjunction with voltage-controlled mixing console functions and to accommodate up to 256 functions. Scanning was performed in a simple sequential fashion. Thus the scan rate was dependent on the number of automated functions. (For each function, 500 microseconds was required.)

In order to increase the speed of the system, a quinary form of data encoding and storage was used, in which the analog signals (voltages) from the console functions were encoded to analog quinary "words," consisting of four cycles of a sine wave at any one of five amplitudes. The first "character" of each "word" consisted of the sine wave at a reference level. The next three "characters" consisted of the sine wave at any one of five amplitudes. Thus each word could be made to represent the data of an ordinary three-digit quinary word (roughly equivalent to an 8-bit binary word). By this schema, data was encoded with satisfactory speed onto tape.

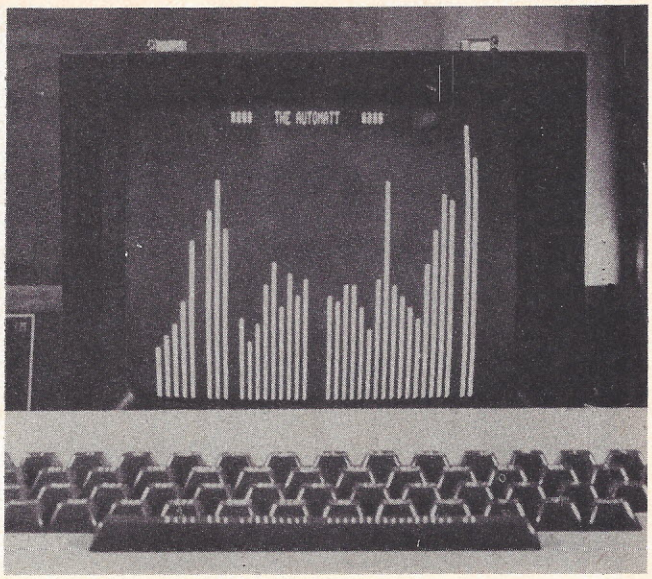


PHOTO 2 Graphic representation of the mix.

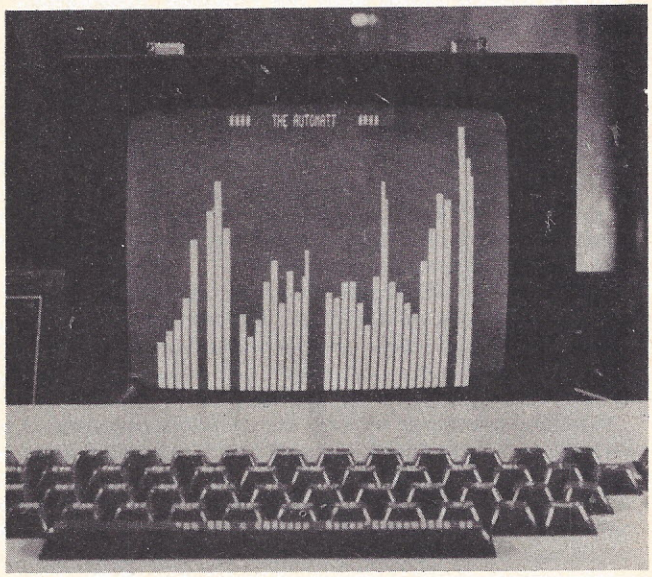


PHOTO 3 Current console settings displayed alongside the "frozen mix." Three settings do not match (note three unmatched bars).

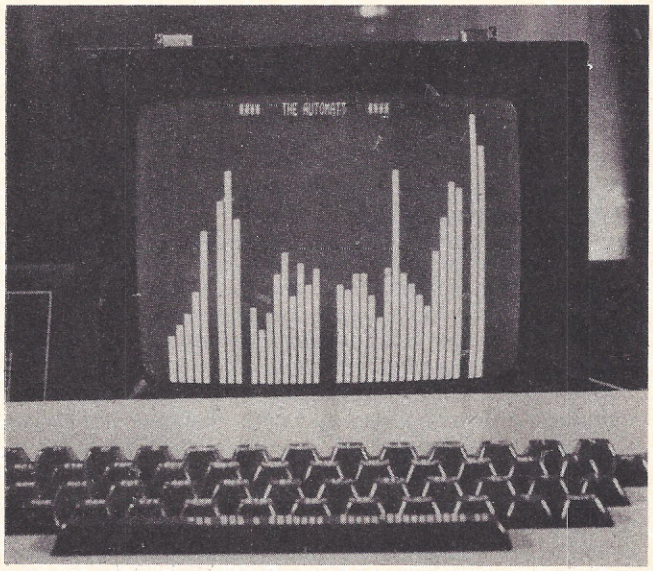


PHOTO 4 Console settings adjusted to match exactly the previous mix — in a matter of seconds.

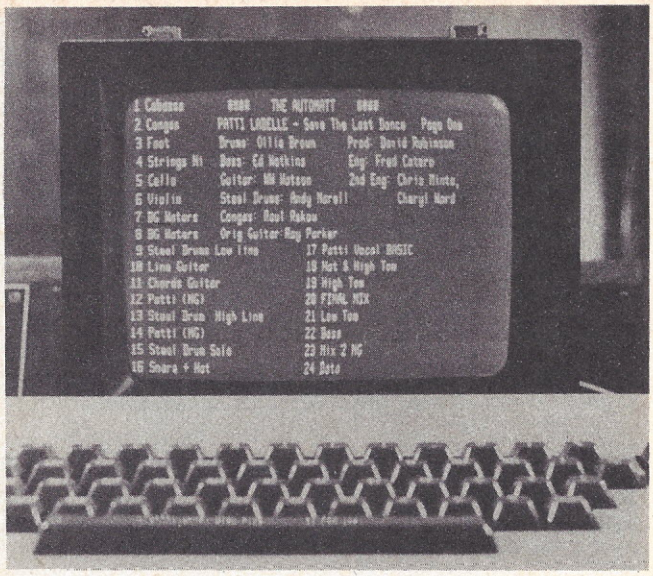


PHOTO 5 Display showing that any desired text can be stored along with the console automation data on the tape.

Second generation units offer two major improvements. Allison reexamined data requirements for mixdown purposes, concluding that the earlier idea of straightforward, sequential scanning and encoding was not the best answer. They reasoned that most console functions at any particular point in time are not changing and that encoding functions that don't change wastes time.

They came up with the notion of priority encoding of console function data. And with its time-saving potential, they decided on a more stable, reliable method of coding data on tape than the quinary one, which had placed rather heavy demands on tape alignment and quality.

In second generation thinking, the console is conceived of as 64 rows of data-producing elements, each row with 4 discrete 16-bit locations. This configuration and number was viewed by Allison as large but not unreasonably so in the present state of expanding technology. Thus the console is viewed as a matrix with 64x64 or 4096 sources of 16-bit data.

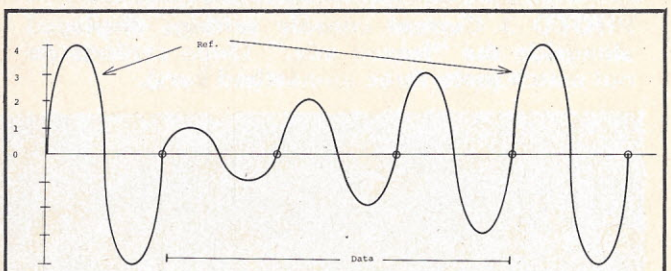


Figure 2. A quinary "word" encoded/stored by the Allison 256 Programmer.

With this console model in mind and the notion of priority encoding, Allison decided on a binary word with a 12-bit address port, a 16-bit data port, a parity bit, and a parity time interval.

Priority encoding is accomplished as follows: The status of each matrix element or console function is examined every 3.2 milliseconds (the time required to encode a single word onto tape) but is encoded only if it has changed. The process is as follows: Each row of 64 16-bit locations is processed by an individual I/O port. Every 3.2 milliseconds, each word is loaded and compared to the word that was previously loaded from the same location. If the data is different, the data is stored in one RAM and the address is stored in another.

At the same time that this parallel operation is going on, the master Encoder/CPU is searching the priority RAM of each port, so it knows which port to service next.

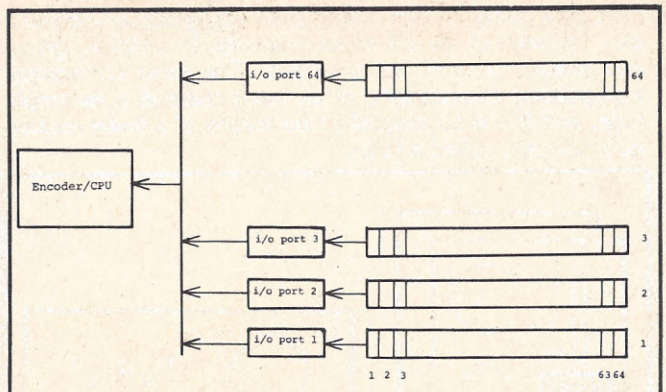


Figure 3. Priority encoding of data through the use of I/O ports for each row of data elements.

Thus the delay time for the system is 3.2 milliseconds when a single console function is changing and 3.2 milliseconds is added for each additional console function that is changed at the same time. Since it is unlikely that any more than 2 or 3 console functions will be manipulated simultaneously, this system is quite responsive.

In the first generation, encoding time per function was faster (.5 milliseconds), but since all functions had to be encoded, the "system" delay time was considerably longer. For 32 functions to be encoded by the first generation, the delay time was 16 milliseconds; for 256 functions, the required time was 128 milliseconds. With the second generation Allison, the delay time, assuming the unlikely condition that 4 functions are simultaneously changing, is 12.8 milliseconds. In short, the second generation accommodates many more functions and encodes them more rapidly.

Between the first and second generation, the other main difference lies in the console interface. With the first generation, an analog interface was chosen largely for reasons of adaptability to existing consoles. In write mode, voltages from the console were encoded to quinary "words" that were written on tape; in read mode, these were decoded and applied to voltage-controlled devices on the console. Data can be read, decoded, and applied to the console any number of times without loss to that data.

But in a process that decodes data, sends it to the console, and re-encodes from the console (such as an update that leaves certain channels in read mode), variations due to analog conversion can occur, and when the process is repeated many times, significant accumulation may develop. But multiple updates by the producer and engineers must be assumed, as the purpose of the system is refinement and gradation. In order to deal with this problem in the first generation, resistors and offset potentiometers were employed. Still, fine calibration of the equipment was required if errors were not to accumulate.

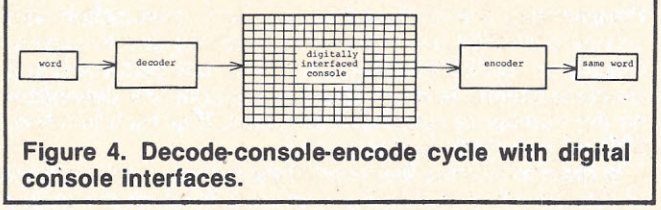


Figure 4. Decode-console-encode cycle with digital console interfaces.

In the second generation, Allison felt the time had come to solve the problem in the obvious way, namely, by a digital console interface, i.e. digitally-controlled amplifiers, equalizers, etc. Thus a word that is decoded from a data track, passes through the console, and is re-encoded will always be the same word.

In that way, multiple updates of a mix can be made easily, conveniently, and without fear of losing the "accomplishments" of previous mixes.□

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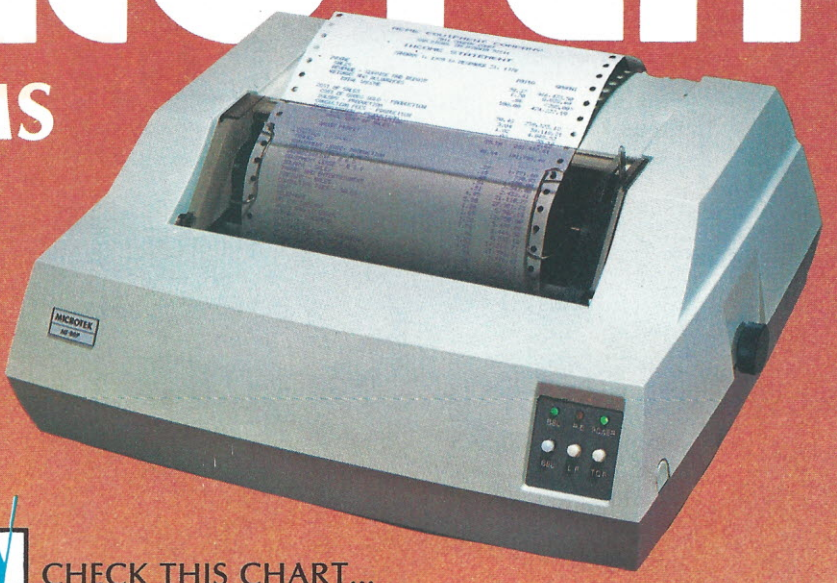

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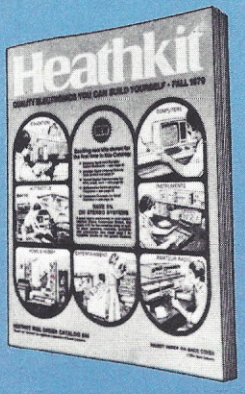

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CIRCLE INQUIRY NO. 29

THE COMPUTERIZED AUTO

By Terry Costlow, Editor

Micros are beginning to become a powerful tool in the nation's battle to conserve energy while keeping the air clean. While achieving one of these goals usually makes it very difficult to reach the other, Detroit auto makers are finding that microcomputer technology makes the two opposing goals compatible.

One of the leaders in this area of micro-electronics is the Ford Motor Company. They began using micros as an engine control device on a limited number of 1978 cars. It was a success, and Ford has been expanding the use of micros each successive year. This year, in addition to using microprocessor chips in engine control, processors are being programmed to provide a functional and interesting dashboard warning system that tells the driver the condition of many parts that can become troublesome without his knowledge. Although it's not the first application in the automotive field, for many auto purchasers it will be the first recognizable use of micros.

"With the top of the line cars which have the message center, the computer will be a strong selling point, a very desirable option. But the micros in the engine compartment will be just like any other part of the engine. No one cares how it works just so long as it does," says Jim Allen, a Ford representative. The Continental Mark VI and the Lincoln Continental will feature the new microprocessor function.

The dashboard message center uses a 6800 chip with 64K of ROM for the firmware. The RAM chips are 5101 CMOS types, with custom CMOS integrated circuits handling miscellaneous duties such as housekeeping and hardware checks. The system usually displays the time in digital form, followed by A.M. or P.M. But when there is a problem or the driver pushes the Check button, the status of the parts is displayed on the lighted panel.

The chips monitor 11 vehicle functions. In the critical categories are warnings for low brake pressure, alternator, oil pressure and the engine temperature. Secondary warnings include the distance until the gas tank is empty, and trunk or door ajar signals. These messages are displayed every 16 seconds until the situation is remedied.

There are also warnings for low washer fluid and headlight, taillight or brakelight malfunction which appear whenever the problem arises. The driver can check any of the 11 categories by triggering the Check Out button.

The message center can display a total of 36 messages using the dashboard display. The total vocabulary is 77 words. Other components of the system include two peripheral interface adaptors, a display assembly with two latch drivers, two regulators, a display logic and two dual operational amplifiers.

Microprocessors are also used in the fuel gauge operation, along with a display driver and a dual operational amplifier.

The fuel level is indicated by a 32-segment bar graph. The International Standards Organization symbol for gas (a fuel pump and hose) flashes when the tank gets low.

While these microprocessors in the passenger compartment will be the most exciting and draw the most attention from potential buyers, the chips which are found under the hood actually do the most work, as well as surviving in a much tougher environment.

Ford engineers are currently using two microcomputer-based systems in their attempt to create a fuel-efficient car that meets the strict emissions standards. Intel Corporation, a chip manufacturer and OEM supplier, is providing chips for the engine control packages. The 8048 is being used in both applications.

Intel has been supplying chips to auto makers since June, 1978. The 8048 has remained important despite the introduction of newer, more powerful chips.

"The 8048 has become fairly popular in automotive applications since it was the first one-chip processor to be introduced. Now it's well-proven and tested; we've had quite a bit of experience with it," says Brian Knowles, an Intel spokesman.

The simplest of the two systems is the Microprocessor Control Unit (MCU). This unit is found in Pintos, Bobcats, Mustangs and other cars which have 2.3 liter engines. The processor monitors the exhaust emissions then adjusts the carburetor to reflect these findings.

If the sensors find too much oxygen in the exhaust, the microprocessor will order an adjustment to put more fuel into the intake mixture. If there is too much fuel, the mixture will be adjusted to burn the gasoline more efficiently.

Along with this basic operation, the 8048 operates in an open loop under certain circumstances. If the engine is cold or is accelerating rapidly, the computer will override its standard instructions, burning more gasoline until the engine returns to normal operations. Without this override functions, the computer would not give a cold car a chance to warm up rapidly, and it would cause the engine to cut out in hazardous situations like entering the freeway or passing.

The objective of both computerized systems is the same, to achieve stoichiometry, the chemically correct combination of hydrogen, carbon and oxygen. The second attempt by Ford to achieve this goal is the Electronic Engine Control system. It is found on the 1980-model Lincoln and Mark VI which have the five-liter engine.

EEC-II, the second generation of a microcomputer-based system, is more sophisticated and complicated than the MCU. It uses four chips, two less than its predecessor, EEC-I. The first generation unit, which used chips provided by Toshiba, was introduced on the 1978 Lincoln Versailles.

Along with the four chips used in EEC-II, there are custom designed integrated circuits and seven sensors. The sensors monitor the crankshaft position, throttle position, manifold absolute pressure, barometric pressure, coolant temperature, inlet air temperature and the exhaust gas valve position. The chips and integrated circuits are mounted in a module located in the engine compartment, while the sensors are located at various points on the engine.

The solid state module will then calculate spark advance and gas recirculation based on the input provided by the sensors.

"In engine control, the main thing the processor does is to compute extremely complex calculations. It must draw on a complex group of figures that specify what should be done in each circumstance; whether the engine is hot, cold, accelerating rapidly or whatever," says Knowles.

One of the keys for the Intel and Ford engineers who designed the system was to provide a place for the chips so they would not be destroyed or their work impaired by the high temperatures, vibrations and strong electro-magnetic charges created by the engine. The solution to this problem is a tightly sealed "black box," and very extensive planning during the construction and design stages.

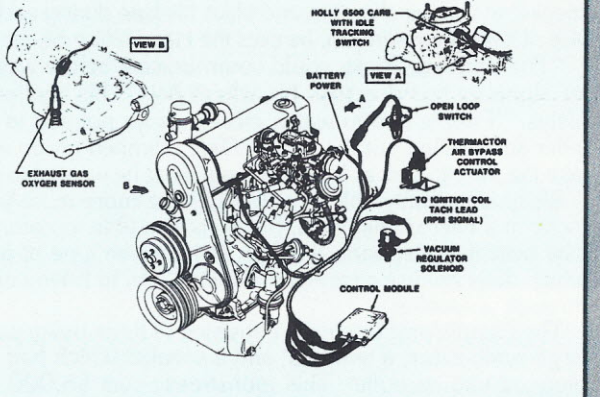
"There's no doubt it's a very tough environment, but if we do the job right on the front end, the microprocessor should be extremely reliable. It should last at least the life of the car," says Knowles. "There is much qualification testing done before production to detect any design defects. And the chips are burned in from 48-72 hours, as a rule."

According to Knowles, the system will last until the rest of the car falls apart because there are no moving parts to break down. Should any of the microprocessor chips go bad, however, the unit will be fairly expensive to replace. It will definitely cost more than the old-style parts would have, because "it's hard to compete with a few weights and springs for cost," Knowles says.

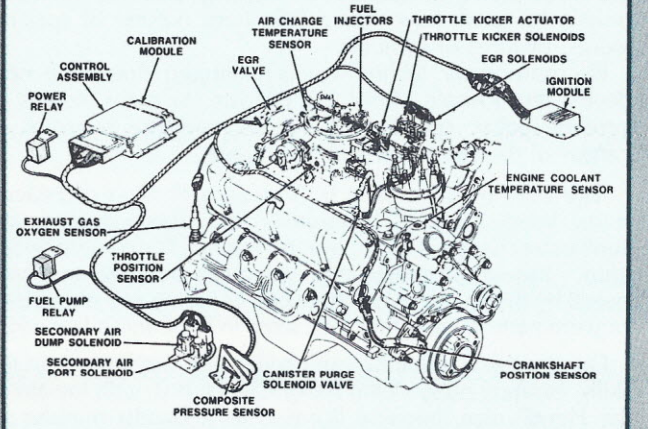
Without the use of computers and other electronic operations, auto makers would doubtless have much more trouble meeting stricter government regulations for emissions. Before computers were brought into the picture, nearly everything Ford had done to lower emissions had cut gas mileage.

Some of the earlier methods attempted were to retard the spark, add thermometers and adjust the air-fuel mixture. These actions cut the gas mileage considerably.

But with micros controlling the engine, everyone will benefit, according to Henry Nickol, chief engineer of Ford's Powertrain and Chassis Engineering Department. "For our customers, EEC means lower vehicle operating costs, higher reliability and better performance. For us, it means more efficient production, and it may be the only way to meet future fuel economy and emission standards."□

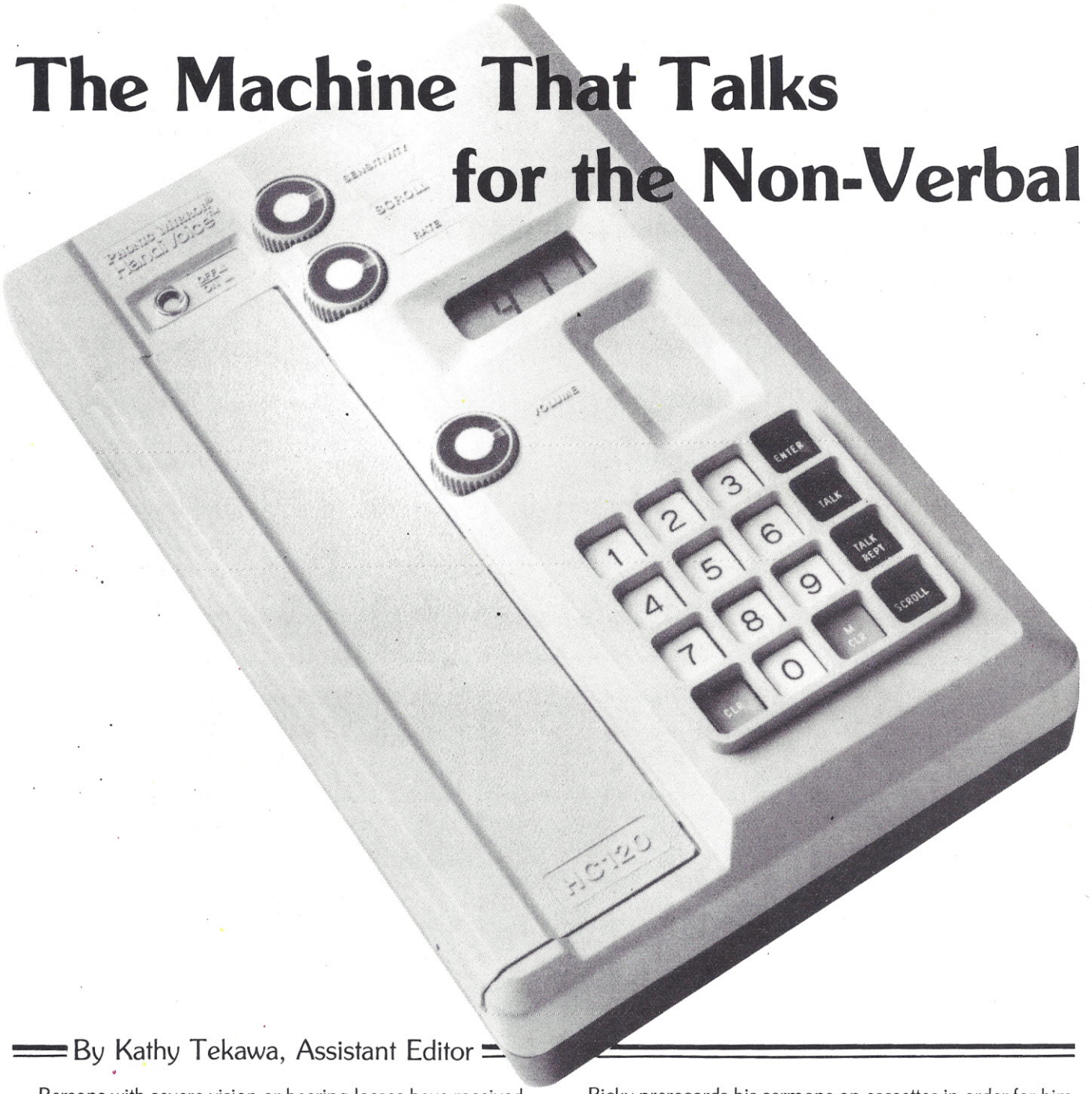


The 2.3 Liter MCU System



The EEC-II System

The Machine That Talks for the Non-Verbal



By Kathy Tekawa, Assistant Editor

Persons with severe vision or hearing losses have received aid from powerful glasses or hearing aids, but persons unable to speak have found little help outside of spelling words, pictures or symbols.

Microprocessor technology is changing this. One new device, the Phonic Mirror HandiVoice, talks for victims of cerebral palsy, spinal cord injuries, multiple sclerosis or cancer of the voice box and/or tongue.

The unit, manufactured by Votrax, a division of Federal Screw Works, and HC Electronics, Inc., uses a single board synthesizer which is based around the 6800 microprocessor chip. Through programming, which can be done on a keyboard by the user, the machine can combine any phonemes or word parts to say almost any word in the English language.

Despite the fact that he can't speak and has limited motor skills, cerebral palsy victim Ricky Creech has, with the aid of the HandiVoice, become licensed as a Baptist minister in Siler City, North Carolina. The only part of the body Ricky can control is his head. He uses a pointer attached to his forehead to punch the buttons on the keyboard of the device.

Ricky prerecords his sermons on cassettes in order for him to figure out each sentence carefully and for the flow to be smooth and fast. The 25-year-old Baptist minister is a guest speaker at various churches and plays his tape during each service. If it is a short sermon, he uses the HandiVoice on-the-spot.

"The only way Ricky could communicate before was with an alphabet board across his wheelchair," his mother explains. "People had to watch closely as he pointed to each letter and spelled out the words. Only a limited group would take the time to wait as he spelled out what he wanted to say."

Ricky is not only able to communicate more quickly with those in a near vicinity now, but he is also able to communicate over the telephone. He has an intercom type of phone which does not use a receiver, allowing him to listen and talk through a speaker.

The HandiVoice originally consisted of three bulky parts; a large synthesizer, a terminal, and a speaker which had to be plugged into an outlet. This monstrosity cost $6,000.

Obviously, this was not a sufficient system. The unit needed had to be portable, battery-operated and able to be held by one hand.

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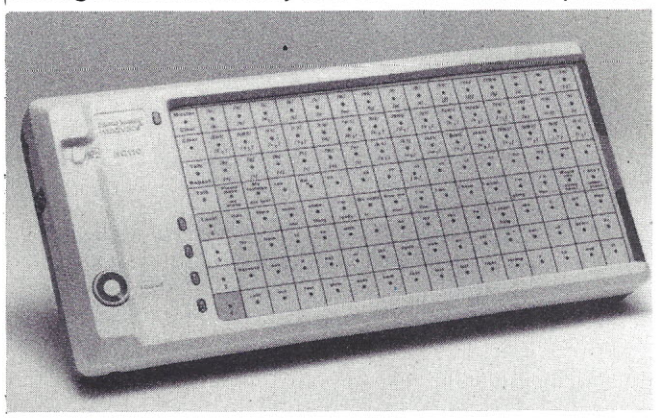
CIRCLE INQUIRY NO. 3

In November 1977, the HandiVoice was introduced in a portable prototype form and it came out on the market one year ago. The synthesizer was reduced from four printed circuit boards to one. With advancements in microprocessor technology, the phoneme synthesis required very little storage and was able to run as low as 150 baud and still contain an unlimited vocabulary.

There are two models of the HandiVoice now out on the market, each selling for $2,195. The HC 110 is the larger of the two units and is in a lap-board style for users to carry on their wheelchairs. It is preprogrammed with 373 words, 45 phonemes, 13 morphemes, 17 short phrases and the English alphabet. This enables the user to "say" just about anything by combining these features.

The vocabulary is printed on the face of a touch-sensitive key pad so the individual can see and touch whichever word he wants to use. The person is able to choose his selection and the message is held in memory until the "talk" button is pushed.



The HC 120, the model Ricky uses, is for persons with more limited motor skills. It looks like a handheld calculator and operates in a similar manner, with word storage and recall capability. The keyboard consists of numbers rather than words. In order to make the device speak, the user punches a three-digit code, then the "talk" button. For example, when Ricky wants to say, "How are you?" he will punch the code 411 and the "talk" button with the pointer attached to his head. Then the unit would ask the question.

The "talk repeat" key is used in cases such as emergencies. For instance, if a user wants to say "I need help," he presses the code 400 and pushes "talk repeat" so that the phrase keeps repeating itself. The volume is also controlled by the user with the volume knob.

The HC 120 is preprogrammed with the same features as the 110 except it has 893 words rather than 373. It has a larger vocabulary because it doesn't need to have all the words printed on a keyboard.

The HC 120 has either audible or silent automatic storage scanning when used with auxiliary controls. To maximize the use of the available motor skills of the severely handicapped, breath, hand or muscle auxiliary controls are used to apply to individual needs.

When the only part of the body that can be controlled is the person's breathing, an auxiliary breath control is used. The three-digit keyboard display panel scrolls the numbers, 0-9, from left to right. When the user wants to code in a number he blows on the auxiliary breath switch to make the digits in the panel stop.

One user, who has been in a Michigan V.A. hospital, has been non-verbal for seven years. The only way he communicated with his wife was by blinking his eyes whenever she repeated the alphabet. The doctors working with this patient were not sure if he could understand anything when they spoke to him, but they thought they would try the HandiVoice as part of a study on prosthetic communication aids.

To their surprise, he caught on rather quickly, fully understanding the instructions given to him. He controlled the talking unit by using a switch that he moved with his cheek. "This fatigued him very quickly, however," his doctor explains, "so now we are trying the unit with the listener holding the HandiVoice and the patient raising his eyebrow whenever he sees the code he wants. This is proving to be extremely effective, even though our patient cannot use the machine independently yet."

The doctor describes one problem which occurs when a listener is coding in the numbers. "There is a split second between the time the patient raises his eyebrow and the listener pushes the button. A wrong number can be coded in fairly easily, so the listener has to be sure to ask and make sure the number programmed is the correct one."

Another area which may seem to present problems is the fact that so many codes have to be memorized in order to communicate with the HC 120 model. Since many users cannot turn pages, books are difficult, if not impossible, to use. According to Diane DeHaven, Marketing Manager of Votrax, there are many effective, practical ways to learn and she finds that the user is so eager to communicate he learns quickly.

"For example, we sent Ricky a dictionary of codes before he even received the unit and he had many of them memorized before he even got the machine," DeHaven says. "Many speech pathologists tape record the codes, or other users have a big poster board of the codes in front of them and they learn them that way."

DeHaven has been working on the HandiVoice since it was in the bulky, three-unit stage. She says she doesn't exactly know how many HandiVoices have been sold since they have become portable, but Votrax wants to make sure that those who do purchase the unit will be able to utilize it.

"At times people might get excited about a new device, thinking it would be perfect for a certain person or themselves. Then they purchase it without finding out if it is really suited for them," DeHaven says.

In order to make sure an individual will be able to use the HandiVoice, a professional recommendation is required before any purchase takes place.

In the synthesized voice of the talking unit, the tonal qualities and inflection levels have to remain at a certain point in order to maintain maximum understanding. All the systems have the same sound, a simulated male's voice. According to DeHaven, the users aren't concerned whether the voice is male or female.

"People who have been in a world of silence are so excited about being able to speak they don't really care what the voice sounds like," she says.

The voice has a mechanical, almost robot-like sound, but it is clear and distinct when the words are preprogrammed. It becomes more difficult to understand when the phonemes and morphemes are combined to create words and phrases.

The user must take the time to figure out how to combine the sounds to create the words he wants to use. This is not an easy task. For a speech pathologist it comes naturally. But it is much more involved for those lacking experience with word sounds. That is why Ricky and others who want to give a sermon or speak for a long period of time will tape record their message beforehand, so they can figure out each individual word that is not programmed into the device.

Although it seems like a slow process for society to accept any new device for the handicapped, one doctor at the V.A. hospital in Michigan marvels at the number of people who want to try out the HandiVoice.

"We leave the machine with the patient and it's amazing how many visitors and nurses are always coming by to talk with him. People who don't even know him, but are there visiting his roommate, see the HandiVoice and want to try using it. I was surprised because people tend to shy away from machines and those who are handicapped. But of course, it's not only the machine they are attracted to. This particular patient has such a refreshing personality; his desire to live and hang in there is incredible."□

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BLENDING MICROS INTO HOME APPLIANCES

By Roger Banks Texas Instruments Incorporated

Man must have always been a lazy creature. But perhaps therein lies the secret of his ingenuity. For thousands of years, it appears, he has labored much in order to develop the means by which he will have to labor less.

Once primitive man succeeded in harnessing flame for light and warmth, it was only a matter of time before he discovered how to use fire for cooking. From there it was but a short step to the next plateau of culinary progress — the first home appliance, the simple wooden skewer on which to hang the meat while it cooked.

Advancement through the centuries was very slow. Until this century, fire was used for all appliances in the home, from heaters to stoves to irons, which were heated with coals. On June 6, 1882, a New Yorker named Henry W. Seely received a patent for his invention of the electric iron. His iron was of little practical value because not only were there no power companies until 1890, the iron was only powered while it sat on its stand. It quickly cooled once removed.

Even after the power companies began to supply electricity to urban areas, the development of electric appliances was frustratingly slow.

In 1905, a utility company employee designed his own iron and distributed it to a few dozen customers of the power company where he was employed. He then convinced his management to generate electricity all day on Tuesday to allow customers to "iron" their clothes. The result was an instant love affair between customers and "the iron with the hot-point." A new company, a new and long-lasting trade name and a new industry had its start.

It wasn't until the late 1940s that an electronics revolution began to impact the design of kitchen appliances. The transistor was invented at Bell Labs and later licensed to a number of companies.

Shortly thereafter, both Whirlpool and Maytag introduced clothes dryers with electronic controls. Not only was the transistor marking the beginning-of-the-end for the vacuum tube, it was marking time for mechanical appliance controls as well.

At the same time, another technology was evolving that would have a major impact on the appliance industry. During World War II, radar technicians discovered that the microwave energy they were transmitting to locate aircraft was capable of generating heat. Efforts were made to harness this as heat energy and a new cooking process evolved. At first, applications were cumbersome, but in 1955 Tappan perfected a microwave oven for the home, introducing a 24-inch built-in model requiring 220 V.

For the imaginative consumer, these new ovens brought the magic of space age electronics into the kitchen. They could put a frozen hot dog and a roll on a paper plate, put it in the microwave oven and soon pull out a cooked hot dog in a warm bun resting on a cold plate. The fact that the hot dog was overcooked on one end and barely cooked on the other had little meaning to the imaginative cook. This was technology at work.

As the market for microwave ovens expanded, the consumer began to seek new features and conveniences. Some manufacturers began to offer a defrost cycle, a switch that turned the magnetron OFF and ON periodically so that the frozen food absorbed the heat more slowly. Before this, parts would be frozen while another area would be half cooked. The food was partially to blame because different densities of food absorb microwave energy at different rates.

Another problem was the uneven reflection of the microwave energy within the oven cavity. This tended to concentrate the energy in some locations and minimize it in others. A first solution to this problem was the development of a "stirrer." This was a simple metallic blade that spun around at the top of the oven, increasing the reflection of energy within the oven.

A second problem associated with the defrosting of foods was proper timing. Cost-effective electromechanical timers were limited in how precise a cycle could be controlled. Also, as the magnetron was rapidly cycled ON and OFF, the repeated surges of power into the tube tended to increase the chance of a premature burn-out.

Among the microwave oven manufacturers facing this control packaging problem was Magic Chef, Inc. of Cleveland, Tennessee. The company had well over 50 years of serving the homemaker, having evolved from a foundry that made cast iron cookware to a large national manufacturer of kitchen appliances, vending machines and air-conditioning systems.

In 1971, Magic Chef formed the Microwave Oven Division, which has developed into one of the leaders in the microwave oven industry. Computer technology has helped them remain in the forefront.

"We look upon the microwave oven as a glamour product that naturally commands a higher price," said Hoyle Rymer, Vice President of Operations for Magic Chef, Inc. "We turned to electronic digital controls because they not only added to

the glamour of the product, they allowed the preparation of many more and different foods with less and less attention required by the cook."

Most of the design considerations revolved around the need for more precise timing. Research indicated that the faster the cycles, and the more power level settings available, the better the cooking results. Solid-state electronic timers offered one-second cycling of the magnetron, a speed not available from an electromechanical switch. By adding discrete triacs and SCRs for positive AC power control, a far more stable voltage was sent to the magnetron, adding substantially to the tube's reliability.

This rapid cycling of the magnetron provided an infinitely variable heat control ranging from 10% to 100% power. The next step was to get a device that would control the cooking, so the chef could set the oven and forget about it. Magic Chef selected the Texas Instruments' TMS1000 family of single-chip microprocessors to handle this chore. The most distinctive use of the chips is the glass capacitive touch control panel.

Among the single-chip microcomputers that are used with capacitive touch panel control is the TMS1117, a preprogrammed member of the TMS1000 family. Together with a touch panel interface circuit, two ICs provide the minimum circuitry required to control the cooking, the digital clock, the display, operating mode lights, magnetron microwave tube, the energy "stirrer," an internal light, and a broiling element.

The key to controlling the operation of the oven is the touch panel. The glass panel is actually part of a unique, solid-state switching system. The TMS1976 interface chip translates the signals from the touch pads on the panel into digital signals that the TMS1117 can act upon.

Behind each of the touch pads are two conductive strips that continually carry a low-voltage signal emanating from the microcomputer. When a person touches a pad, the body's natural capacitance causes a drop in this low-voltage signal. Of course, this could happen every time a person wipes his hand across the panel. To avoid this type of error signal, a "debounce" is programmed into the TMS1117 so that only a touch of at least 200 milliseconds will register as an input to the microcomputer.

The sequence can be followed in Figure 1. The microcomputer continually scans each of the columns of the touch panel through the three output lines, R_2, R_4 and R_6. When a key is touched, body capacitance reduces the signal in that column. This reduced signal is then transferred through the row of the touched key to the appropriate input line on the interface chip. These are designated C_1-C_9. The encoder section of the TMS1976 reads these incoming signals in prioritized order, 1-9, to prevent an erroneous signal being sent to the microcomputer, such as when two keys are touched at once.

The encoder converts the signal into a 4-bit BCD word and transmits this through the Y outputs to the K inputs of the TMS1117 microcomputer. Information is then processed and fed to the O and R outputs.

The TMS1976 also provides a time-base signal to control the digital clock, the four cooking timers (defrost, cooking cycles 1 and 2, and broil), and the alarm timer. The time base signal is the frequency of the AC power line, providing a pulse to the microcomputer every 16.6 ms at 60 Hz or every 20 ms at 50 Hz. The microcomputer then records the inputs in a counter that control the clock and timers.

"The hardest thing in developing programmable controls for

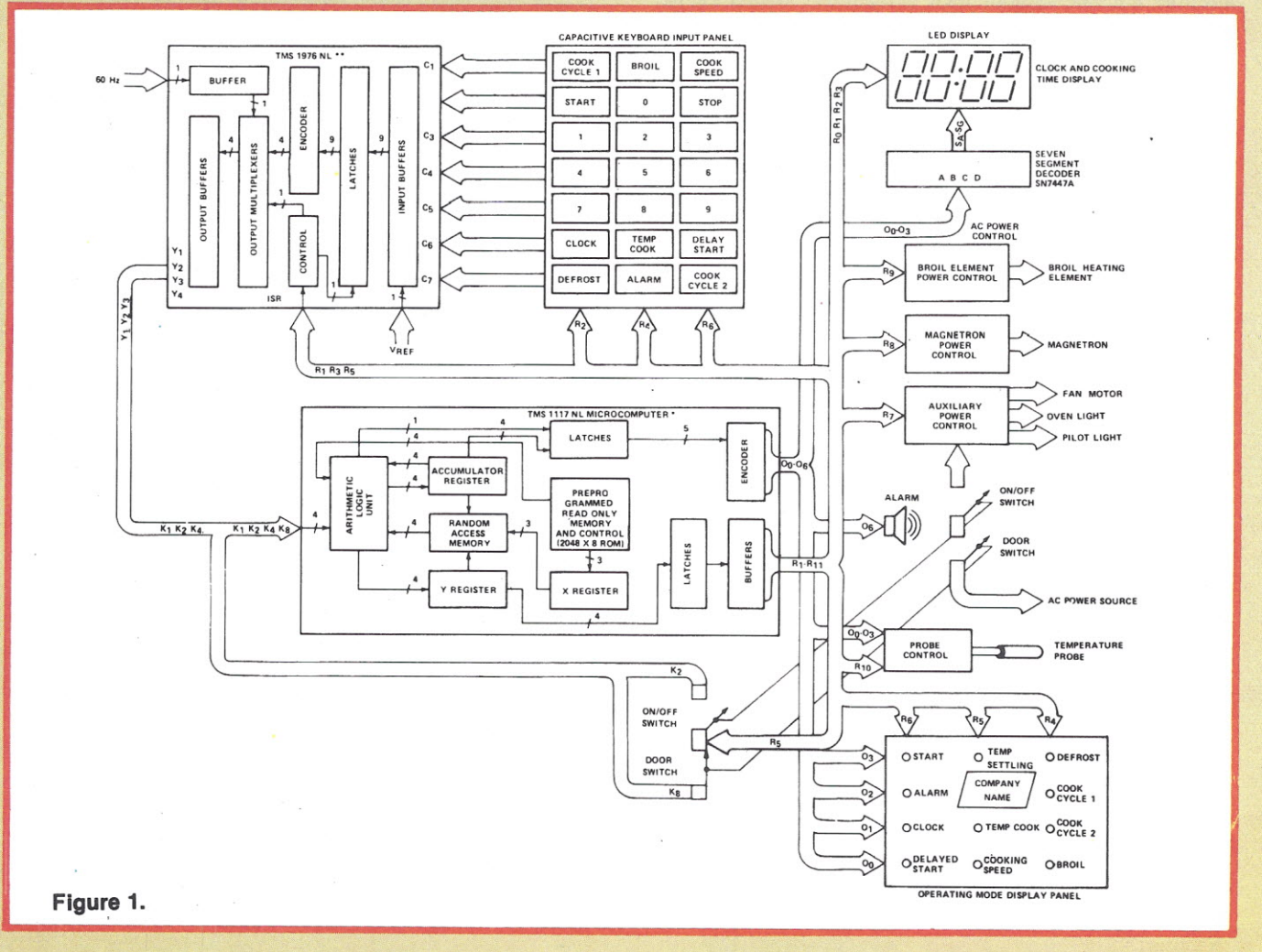
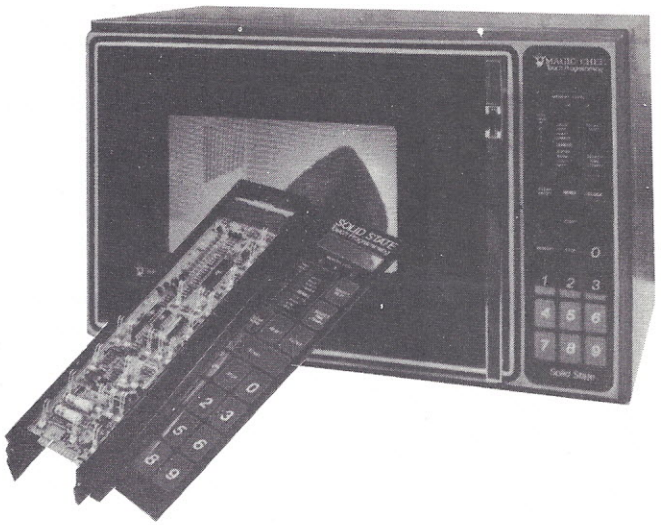


Figure 1.



the microwave oven has been to translate what a cook does in the kitchen to the software designer," commented Mr. Rymer. "His problem has been to translate the benefits of the microcomputer into product benefits of practical value to the consumer. Too often, these two goals have been poles apart. Electronic digital control has spurred the acceptance of the microwave oven and a host of other products, but 'programmability' can be easily overdone with features and gadgetry that often confuses rather than helps the homemaker.

"While electronic digital controls have given us the opportunity to offer the homemaker a better, more accurate and more versatile microwave oven, the application of these new controls are not without their problems," added Rymer. "Appliance manufacturers must work more closely with microcomputer manufacturers so that the controls add value to the appliance and not just gadgetry."

Gadgetry or not, the consensus is that any appliance that has a motor or requires some form of timing control is a candidate for microcomputer control. The microcomputer is changing the hardware-oriented world into one dominated by software design. The benefits are not only immediate convenience and efficiency for the consumer, but long term economy for the manufacturer.

From the first electronically-controlled clothes dryers to handheld calculators and microwave ovens, the microcomputer is bringing digital control into all facets of home life. In the laundry, for example, moisture sensors turn off the heat when the humidity within the dryer drops to a predetermined level. The clothes then continue to tumble during a cool-down cycle.

In 1978, the Hamilton-Beach Division of Scovill Manufacturing Company introduced an electronic blender and food processor that both use the same standard electronic control. In addition to programmable timing and speed controls, both offer a metric-to-English conversion calculator for commonly used ingredient measurements. While some might look upon this as an extravagant extra, it is a simple matter of programming that provides the convenience of measurement conversion at the actual point at which the ingredients are being measured.

At about the same time, Sears, Roebuck and Company began marketing the Kenmore Solid-State Dishwasher, a top-of-the-line model with a microcomputer-based control featuring energy-saving cycles and other special operations.

Home computers and energy management systems perhaps offer the most exciting new developments in home electronics. The potential for the home computer has yet to be developed, but most agree that it will eventually become as common as any other home appliance — an intelligent television system that entertains, educates, provides monitoring functions, plays games, provides access to a variety of distributed databases, helps with household record keeping, controls the environment within the home as well as monitors smoke detectors and security systems.□

An Entertaining Entrance to the Home

One of the first ways the microprocessor will enter the home of the average American is in the television set. While most people can go without a microwave oven, a computerized blender or a microcomputer system, very few will "rough it" without the entertainment provided by television.

The basic use of chips in today's televisions is to control channel changing. Microcomputers interfaced with touch-sensitive panels are responsible for fine-tuning to get the best picture, and in some cases they allow the user to program in the channel changes he wants during the week.

Magnavox uses a Mostek 3870 chip which utilizes RAM for Scratchpad Memory with a 64-word capacity. The PROM is preprogrammed with up to 2048 words.

The most used portion of this microprocessor is the Accumulator. Data is sent to the Accumulator, which then forms one input to the Arithmetic Logic Unit, with the other input being provided by the Data Bus.

Although the same Mostek chip is used in different Magnavox models, the microprocessor modules are not interchangeable since the ROM is not the same. The importance of the chip is great: if it goes down, the TV either won't work or will be stuck on one channel. But the price of the micro makes it very expendable. The training center booklet states: "The microprocessor is simply another black box. It either functions normally or is replaced."

At RCA, chips manufactured by the company specifically for use in televisions are used. The microprocessors, which were first used by RCA in 1979, are also used in touch tuning. In addition to the standard touch-tune setup, a new model allows the user to have the television retain up to 22 program changes over a seven-day period. The chip also controls the on-off function when programmed to do so.

The on-off switch is interfaced to a plug-in on the back of the set so a lamp of up to 600 watts can be turned on with the set. This gives the convenience of having an automatic TV light, while also helping vacationers make their homes appear occupied while they are on a short trip.

RCA also uses micros in its home video recorder. Because of the additional duties needed to turn on the recorder and television, only four channel changes can be programmed into the tape unit.

As micros become more commonly used in the cheaper portable models, the channel-changing dials will become obsolete. A Magnavox spokesman already considers them on the way out, saying "Those old click-click tuners are almost passe."

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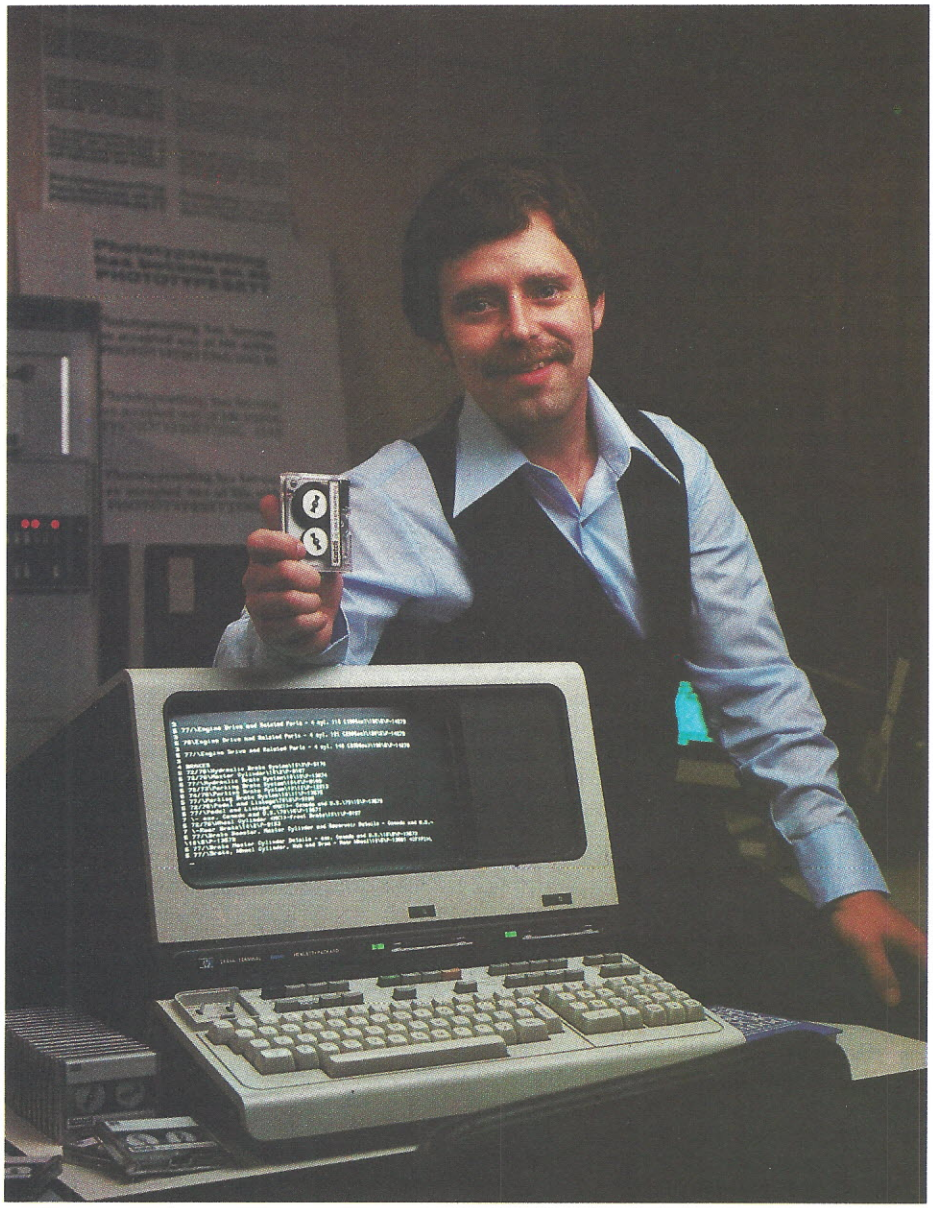

Bill Birkett, Vice President, Trade Graphics, Inc., Livonia, Michigan

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CIRCLE INQUIRY NO. 36

A Simple Mailing Label Program

By Rocky Smolin

Time was, in the bad old days of the first generation, computers were identified with mathematics and number crunching. The biggest revolution in computer consciousness, the one that has had the biggest effect on our society, is the notion of computers as keepers and handlers of information. I have no hard figures to back this up, but I'll bet there's more CPU time being spent these days on the transmission, manipulation, storage, retrieval and display of information than there is generating solutions to problems involving higher math.

Check your software library. Aside from the games, most of the home applications and business stuff is primarily designed to store, retrieve, and display some kind of information: sales, recipes, checkbooks, inventory, and so on.

It is a fundamental fact of life in the world of systems design that for every data file you create, you'll have one file maintenance program to write. Systems flow charts squirreled away in thousands of filing cabinets all over the country are littered with little modules like this:

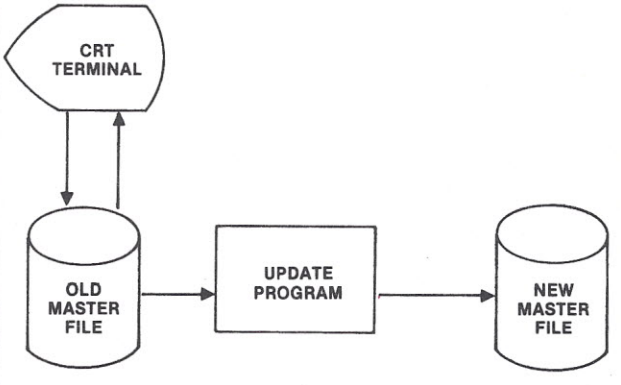

Figure 1. Functional Flow of Update Software.

But maintenance programs are also some of the most tedious and boring programs in the world to write. Ask any commercial programmer. However, when I found I had to keep track of a lot of names and addresses for my business, I found myself once again designing and writing a program that incorporates the four functions of every file maintenance program: 1) add (a record to the file), 2) change (a record in the file), 3) delete (a record from the file), and 4) display (selected information in the file).

THE RECORD LAYOUT

Here's what the record layout looks like:

NO.	FIELD	FUNCTION	TYPE	LENGTH
1	DC$	STATUS BYTE	$	1
2	CN$	COMPANY NAME	$	30
3	A1$	ADDRESS LINE 1	$	25
4	A2$	ADDRESS LINE 2	$	18
5	ZP$	ZIP CODE	$	5
6	TL$	TELEPHONE NUMBER	$	10
7	CT$	CONTACT	$	20
8	P$	POSITION	$	1
9	CD$	PROSPECT CODE	!	2
10	CM$	COMMENT	$	15

The status byte takes on one of three values, 1) "N" which indicates a new record, 2) "A" which indicates an active entry in the file, and 3) "D" which means delete this record the next time 'REORG' is run. REORG reorganizes the file. If you don't want or need to mess with the "N"s, change the "N" to "A" in line 70. The status byte can take on any value, being a string field, and the amount of information you can store there in the form of a code is limited only by your requirements and your imagination.

Company name, address line 1, address line 2, zip code, and telephone are self-explanatory. I use 'contact' to insert the name of the person I'm dealing with, or perhaps the name of an editor on a press release distribution list. It's displayed on the mailing label in the "ATTN:" space.

'Position' is stored as a numeric value because it's actually a subscript pointing to the string value in the PS$ array. It saves all sorts of room on your disk if you can store a code number instead of repeating the same string information in record after record.

The data statement in line 12 shows the positions I need to refer to. You can add to or change this list as you like. Just increase the PS$ array size in line 4, adjust the FOR loop in line 11, and add what you like to the data statement.

When the need arises, CD$ is going to be a prospect code, which will tell how good a prospect a certain company is. CM$ is a general comment field. You can put anything there you like.

The field lengths are arbitrary. Please feel free to change them if you like. Statement 10020 defines the fields. Think of the field statement as a kind of clear plastic grid you lay over an otherwise undifferentiated string of bytes. Lines printed on the grid define the beginnings and ends of the fields.

Whenever you issue a 'GET' command, one complete sector — 256 bytes — is transferred into memory. You don't have any choice about the length, just the sector number and the file number. The sector appears in a buffer that is attached to the file number.

In this program, there are two records in a sector. The problem now becomes: how to make the field grid fall over the right record. This is done with the dummy field defined as 'M128'. In line 10015, M takes on the value 0 or 1. When M is 1, M becomes a dummy field of 128; when M is zero, the dummy field is zero in length.

The formulas in lines 10010 and 10015 are general case. They transform the logical record number into a physical sector number and a displacement. If you have a file with three records per sector, change all the two's to three's and change the 128 in the field statement to whatever the new record length is.

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HOW TO USE IT

The best programs are the ones that do all your thinking for you. The prompts tell you what to do next and are self-explanatory. Error checking in the code prevents bad data from being operated on. In this respect, this program gets a 'B+'.

Because keyed random access (the ability to retrieve a record merely by passing some portion of the record, like the company name, to the keyed retrieval routine) was not supplied. I refer to all records by record number. This is not as slick as being able to ask for or store a record by its name, but it's effective and simple.

The first thing that appears on the screen after the 'RUN' statement is the question 'FILE NAME?'. Input your file name here. Then 'DRIVE?' appears. Input the drive number. If you put in the wrong number, it will create an empty file on that drive with the same name as your good file.

When you get your file opened, the menu will be displayed. Simply make your selection and you're off!

Do not ever forget to end with '8. END'. This will close the file. If you've changed the file size by adding records to the file and don't close it, the directory will not be updated on the disk and you'll lose that data. If a program which uses disk files should ever bomb out, always issue a 'CLOSE' immediately, to keep the disk directory honest.

If you make a mistake while inputting a new record, just keep going until the end of the inputs. The program will then inquire if everything you input is okay (line 160). If you've made a mistake, and replay "N" to 'AOK', the program will branch to the 'CHANGE' routine, allowing you to make changes to the record.

When you're finished making changes, the program will return to the 'ADD' routine. The change routine (line 205) has self-explanatory prompts. To exit the routine, hit ENTER in response to the query: 'WHAT FIELD TO CHANGE'.

The delete routine gives you a chance to back out: it displays the record to be deleted and asks if this is really the one you had in mind. If so, it puts a "D" in the DC$ field and updates the disk (GOSUB).

Listings on the printer and CRT prompt you for the beginning and ending record numbers. While listing on the CRT, you must hit 'ENTER' between each record display. To exit from this routine back to the menu, before all the records are displayed, enter an 'S' before hitting 'ENTER' (line 745).

Displaying company names and contacts is something added later, as you can see by the way the menu selection is tacked onto statement 26. It is useful, and it shows how easy it is to modify the menu. Just be sure to make the appropriate change to the computed 'GOTO' in statement 40.

The mailing labels routine prints a test label of five lines of X's and two carriage returns. It will keep doing this as long as you input "N" in response to the 'AOK' question (line 920), giving you a chance to line the labels up.

And that's it. Simple programs for simple programmers, I always say. Oh, yes. . .at line 20000 is an error routine which is set with the 'ON ERROR' statement in line 556 and 923. At first my system was notoriously unstable, abounding with random disk errors. I use the error routine to cut down on the bomb outs on the theory that a disk error will not recur ten times in a row. If it does, consider it a hard error, close (very important), and stop. The variable 'E' keeps count of the errors and is reset to zero after every successful disk access.

THE REORG PROGRAM

Although the REORG program is shown here as a separate program, there's no reason why it couldn't be incorporated into the mailing label program and given a menu selection number. I found it less confusing as I was writing it to keep it separate, so that's how it ends up here.

The purpose of the REORG program is: 1) to delete the unwanted records from the file, (those with a "D" in the status byte), 2) to change all the "N"s to "A"s in the status byte, and 3) to sort the file into alphabetical order by the first ten bytes of the company name field, CN$.

Its operation is crude but effective. It scans the entire N$ array, which contains the first ten characters of the company name. Upon finding the alphabetically lowest name, it puts the record number from the X array into the Y array and changes the name to "Z"s, so it will always match high or equal to any other name. At the end of this process, the Y array contains the record numbers in ascending alphabetical order.

This program works best on two-drive systems. Since the new file is pretty much the same size as the old file, there may not be sufficient room on one drive to create the new file.

If you want or need more than the first ten characters of the company name for alphabetizing, change the LEFT$(CN1,10) in line 30. If you want to sort by another field, this is the only statement you have to change.

SUMMARY

These two programs are not the slickest, easiest to use, most foolproof, or all inclusive you'll ever see. However, for those of us who write our own software, the simplest programs are the best. The idea is to get the computer to do something for you as fast as possible. I could have easily doubled the size of the mailing label program if 1) I was being paid handsomely by a big corporation, 2) I wanted to market it and had to make it obvious and foolproof to the most naive user.

If you've got 20 or 30 names and labels to do, forget this program. Find something useful for your machine to do and put the names on index cards.□ **Program Follows**

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EIDOS SYSTEMS

☐ **KISS** — Keyed Index Sequential Search. Offers com- (L) plete Multi-Keyed Index Sequential and Direct Access file management. Includes built-in utility functions for 16 or 32 bit arithmetic, string/integer conversion and string compare. Delivered as a relocatable linkable module in Microsoft format for use with FORTRAN-80 or COBOL-80, etc. ..... **$535/$23**

☐ **KBASIC** — Microsoft Disk Extended BASIC with all (L) KISS facilities, integrated by implementation of nine additional commands in language. Package includes KISS.REL as described above, and a sample mail list program ..... **$995/$45**

All Micropro prices are discounted!

MICROPRO

☐ **SUPER-SORT I** — Sort, merge, extract utility as abso- (L) lute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD, Packed Decimal, EBCDIC, ASCII, floating, fixed point, exponential, field justified, etc. etc. Even variable number of fields per record! ..... **$225/$25**

☐ **SUPER-SORT II** — Above available as absolute pro- (L) gram only ..... **$175/$25**

☐ **SUPER-SORT III** — As II without SELECT/EXCLUDE (L) ..... **$125/$25**

Software with Manual / Manual Alone

☐ **WORD-STAR** — Menu driven visual word processing (L) system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, read/write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning **$445/$25**

☐ **WORD-MASTER** Text Editor — In one mode has (L) superset of CP/M's ED commands including global searching and replacing, forward and backwards in file. In video mode, provides full screen editor for users with serial addressable-cursor terminal ..... **$125/$25**

SOFTWARE SYSTEMS

☐ **CBASIC-2** Disk Extended BASIC — Non-interactive (M) BASIC with pseudo-code compiler and runtime interpreter. Supports full file control, chaining, integer and extended precision variables, etc. ..... **$109/$15**

Structured Systems prices are discounted!

STRUCTURED SYSTEMS GROUP

☐ **GENERAL LEDGER** — Interactive and flexible system providing proof and report outputs. Customization of COA created interactively. Multiple branch accounting centers. Extensive checking performed at data entry for proof, COA correctness, etc. Journal entries may be batched prior to posting. Closing procedure automatically backs up input files. All reports can be tailored as necessary. Requires CBASIC ..... **$899/$25**

☐ **ACCOUNTS RECEIVABLE** — Open item system with output for internal aged reports and customer-oriented statement and billing purposes. On-Line Enquiry permits information for Customer Service and Credit departments. Interface to General Ledger provided if both systems used. Requires CBASIC ..... **$699/$25**

☐ **ACCOUNTS PAYABLE** — Provides aged statements of accounts by vendor with check writing for selected invoices. Can be used alone or with General Ledger and/or with NAD. Requires CBASIC .**$699/$25**

☐ **LETTERIGHT** — Program to create, edit and type letters or other documents. Has facilities to enter, display, delete and move text, with good video screen presentation. Designed to integrate with NAD for form letter mailings. Requires CBASIC ..... **$179/$25**

☐ **NAD** Name and Address selection system — interactive mail list creation and maintenance program with output as full reports with reference data or restricted information for mail labels. Transfer system for extraction and transfer of selected records to create new files. Requires CBASIC ..... **$79/$20**

☐ **QSORT** — Fast sort/merge program for files with fixed record length, variable field length information. Up to five ascending or descending keys. Full back-up of input files created. ..... **$95/$20**

GRAHAM-DORIAN SOFTWARE SYSTEMS

☐ **PAYROLL SYSTEM** — Maintains employee master (L) file. Computes payroll withholding for FICA, Federal and (M) State taxes. Prints payroll register, checks, quarterly reports and W-2 forms. Can generate ad hoc reports and employee form letters with mail labels. Requires CBASIC. Supplied in source code. ..... **$590/$35**

☐ **APARTMENT MANAGEMENT SYSTEM** — Fi- (L) nancial management system for receipts and security (M) deposits of apartment projects. Captures data on vacancies, revenues, etc. for annual trend analysis. Daily report shows late rents, vacancy notices, vacancies, income lost through vacancies, etc. Requires CBASIC. Supplied in source code. ..... **$590/$35**

☐ **INVENTORY SYSTEM** — Captures stock levels, (L) costs, sources, sales, ages, turnover, markup, etc. (M) Transaction information may be entered for reporting by salesman, type of sale, date of sale, etc. Reports available both for accounting and decision making. Requires CBASIC. Supplied in source code. ..... **$590/$35**

☐ **CASH REGISTER** — Maintains files on daily sales. (L) Files data by sales person and item. Tracks sales, over- (M) rings, refunds, payouts and total net deposits. Requires CBASIC. Supplied in source code ..... **$590/$35**

☐ **tiny C** — Interactive interpretive system for teaching structured programming techniques. Manual includes full source listings ..... **$75/$40**

☐ **BDS C COMPILER** — Supports most major features (M) of language, including Structures, Arrays, Pointers, recursive function evaluation, linkable with library to 8080 binary output. Lacks data initialization, long & float type and static & register class specifiers. Documentation includes "C" Programming Language book by Kernighan & Ritchie ..... **$110/$15**

☐ **WHITESMITHS' C COMPILER** — The ultimate in (L) systems software tools. Produces faster code than Pascal with more extensive facilities. Conforms to the full UNIX** Version 7 C language, described by Kernighan and Ritchie, and makes available over 75 functions for performing I/O, string manipulation and storage allocation. Compiler output in A-Natural source. Supplied with A-Natural (see below) requires 60K CP/M ..**$630/$30**

☐ **A-NATURAL** — Narrative assembler with linking load- (L) er, librarian, extensive 8080 subroutine library in A-Natural relocatable format and translators from A-Natural source to Microsoft MACRO-80 source and from A-Natural rel to source ..... **$330/$15**

Software with Manual / Manual Alone

☐ **POLYVUE/80** — Full screen editor for any CRT with (M) XY cursor positioning. Includes vertical and horizontal scrolling, interactive search and replace, automatic text wrap around for word processing, operations for manipulating blocks of text and comprehensive 70 page manual. ..... **$135/$15**

☐ **POLYTEXT/80** — Text formatter for word processing (M) applications. Justifies and paginates source text files. Will generate form letters with custom fields and conditional processing. Support for Daisey Wheel printers includes variable pitch justification and motion optimization. ..... **$85/$15**

☐ **ALGOL-60** — Powerful block-structured language (M) compiler featuring economical run time dynamic allocation of memory. Very compact (24K total RAM) system implementing almost all Algol 60 report features plus many powerful extensions including string handling direct disk address I/O etc. Requires Z80 CPU .... **$199/$20**

☐ **Z80 DEVELOPMENT PACKAGE** — Consists of: (M) (1) disk file line editor, with global inter and intra-line facilities; (2) Z80 relocating assembler, Zilog/Mostek mnemonics, conditional assembly and cross reference table capabilities; (3) linking loader producing absolute Intel hex disk file. ..... **$95/$20**

☐ **ZDT** — Z80 Debugger to trace, break and examine reg- (M) isters with standard Zilog/Mostek mnemonic disassembly displays. $35 when ordered with Z80 Development Package ..... **$50/$10**

☐ **DISTEL** — Disk based disassembler to Intel 8080 or TDL/Xitan Z80 source code, listing and cross reference files. Intel or TDL/Xitan pseudo ops optional. Runs on 8080. ..... **$65/$10**

☐ **DISILOG** — As DISTEL to Zilog Mostek mnemonic (M) files. Runs on Z80 only ..... **$65/$10**

☐ **TEXTWRITER III** — Text formatter to justify and pagi- (M) nate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. ..... **$125/$20**

☐ **POSTMASTER** — A comprehensive package for mail (M) list maintenance. Features include keyed record extraction and label production. A form letter program is included which provides neat letters on single sheet or continuous forms. Requires CBASIC ..... **$150/$25**

☐ **WHATSIT?**** Interactive data-base system using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC ..... **$125/$25**

☐ **XYBASIC** Interactive Process Control BASIC — Full disk BASIC features plus unique commands to handle bytes, rotate and shift, and to test and set bits. Available in Integer, Extended and ROMable versions.
Integer Disk or Integer ROMable ..... **$295/$25**
Extended Disk or Extended ROMable ..... **$395/$25**

☐ **SMAL/80** Structured Macro Assembled Language — Package of powerful general purpose text macro processor and SMAL structured language compiler. SMAL is an assembler language with IF-THEN-ELSE, LOOP-REPEAT-WHILE, DO-END, BEGIN-END constructs ..... **$75/$15**

☐ **SELECTOR III-C2** — Data Base Processor to create (M) and maintain multi Key data bases. Prints formatted, sorted reports with numerical summaries or mailing labels. Comes with sample applications including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC Version 2. Supplied in source code. **$345/$20**

☐ **CPM/374X** — Has full range of functions to create or re-name an IBM 3741 volume, display directory information and edit the data set contents. Provides full file transfer facilities between 3741 volume data sets and CP/M files ..... **$195/$10**

☐ **BASIC UTILITY DISK** — Consists of: (1) CRUNCH- (M) 14 – Compacting utility to reduce the size and increase the speed of programs in Microsoft Basic and TRS-80 Basic. (2) DPFUN – Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sin, arc sin, hyperbolic sin, hyperbolic arc sin, etc. Furnished in source on diskette and documentation ..... **$50/$35**

☐ **THE STRING BIT** — Fortran character string han- (M) dling. Routines to find, fill, pack, move, separate, concatenate and compare character strings. This package completely eliminates the problems associated with character string handling in FORTRAN. Supplied with source ..... **$45/$15**

☐ **BSTAM** — Utility to link one computer to another also (M) equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex) with CRC block control check for very reliable error detection and automatic retry. We use it at 9600 baud. Full wildcard expansions to send *.ASM, etc. 9600 baud with wire, 300 baud with phone connection. **Both** ends need one. Standard and M versions can talk to one another ..... **$150/$5**

☐ **Flippy Disk Kit** — Template and instructions to modify single sided 5¼" diskettes for use of second side in single sided drives **$12.50**

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Shopping List No.7

Software for most popular 8080/Z80 computer disk systems including ***NORTH STAR, iCOM, MICROPOLIS, DYNABYTE DB8/2, EXIDY SORCERER, SD SYSTEMS, ALTAIR, VECTOR MZ, MECCA, 8" IBM, HEATH H17 & H89, HELIOS, IMSAI VDP42 & 44, REX, INTERTEC, VISTA V80*** *and* ***V200, TRS-80 MODEL I*** *and* ***MODEL II, OHIO SCIENTIFIC*** *and* ***IMS 5000*** *formats.*

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LISTING 1

```
0 '
       NAME AND ADDRESS PROGRAM BY:
       ROCKY SMOLIN    LA JOLLA, CA
4 CLEAR 2000: DIM PS$(5)
5 INPUT "FILE NAME";F$:INPUT "DRIVE";D$:F$=F$+":"+D$
6 OPEN "R",1,F$
10 '
       READ POSITIONS INTO PS$ ARRAY

11 FOR I=1TO5:READ PS$(I):NEXT
12 DATA "GENERAL MANAGER","PRESIDENT","VICE PRESIDENT",
       "MANAGER","DIRECTOR"
19 '
       DISPLAY MENU

20 S$="":CLS:PRINT:PRINT:PRINTTAB(20)"ENTER FUNCTION:":PRINT
22 PRINT TAB(20) "1. ADD"
23 PRINT TAB(20) "2. CHANGE"
24 PRINT TAB(20) "3. DELETE"
25 PRINT TAB(20) "4. LIST ON PRINTER"
26 PRINT TAB(20) "5. LIST ON CRT":PRINT TAB(20) "6. NAME & CONTACT LIST"
27 PRINT TAB(20)"7. LABELS":PRINT TAB(20)"8. END"
28 K=LK
29 '
       GET FUNCTION NUMBER
30 PRINT:PRINTTAB(20)"";:INPUT"WHUT'S YER PLESHER";I
31 IF I<1 OR I>8 GOTO 20
35 ON ERROR GOTO 0
38 '
       GOTO SELECTED FUNCTION

40 ON I GOTO 50,200,400,500,700,800,900,1000
50 '
     ********************
     ADD A RECORD
     ********************

60 GOSUB 13000: IF K=0 GOTO 20
64 '
   IF RECORD IS PRESENT, DISPLAY AND GET NEW RECORD NUMBER

65 GOSUB 10000: IF DC$="A" GOSUB 11000: INPUT YN$: GOTO 60

250 LSET A1$=A$: GOTO 210
260 LSET A2$=A$: GOTO 210
270 LSET ZP$=A$: GOTO 210
280 LSET TL$=A$: GOTO 210
290 LSET CT$=A$:GOTO 210
295 P$=A$: GOTO 210
300 CD=VAL(A$): GOTO 210
310 LSET CM$=A$:GOTO210
320 LSET DC$=A$:GOTO 210
400 '
       ********************
       DELETE A RECORD
       ********************

410 GOSUB 13000: IF K=0 GOTO 20ELSE GOSUB 10000: GOSUB 11000
420 INPUT "OK TO DELETE";YN$: IF YN$="Y" THEN LSET DC$="D":
       GOSUB 12000
430 GOTO 410
500 '
       ********************
       LIST TO PRINTER
       ********************

510 A$="PRINTER": GOSUB 14000
520 '
       PROMPTS TO SET UP PRINTER

540 PRINT "TURN PRINTER ON...HIT ENTER";:LINE INPUT YN$
545 LPRINT CHR$(11)
550 PRINT "ALIGN PAPER...HIT ENTER";:LINE INPUT YN$
555 PG=1:NN=0:INPUT "WHAT'S HEADING";PP$:
       LPRINTPP$;STRING$(50-LEN(PP$)," ");"PAGE ";PG:LPRINT" "
556 E=0:ON ERROR GOTO 20000
559 '
       PRINT LOOP

560 FOR K=LO TO HI
570 GOSUB 10000: IFDC$="D" OR ASC(DC$)=0 GOTO 660
580 A$="RECORD# :"+RIGHT$(STR$(K),3)+STRING$(29," ")+
       "DELETE CODE  :"+DC$:LPRINT A$
590 A$="COMPANY :"+CN$+" "+"CONTACT       :"+CT$:LPRINT A$
595 Q$=PS$(VAL(P$))
```

```
66 '
70 LSET DC$="N" ' ALL NEW RECORDS HAVE 'N' IN DELETE CODE
75 PRINT@178,"*":PRINT@128,"";
76 '
       GET NEW RECORD INFO

80  LINE INPUT "    1. COMPANY NAME: ";A$:LSET CN$=A$
90  LINE INPUT "    2. ADDR LINE 1 : ";A$:LSET A1$=A$
100 LINE INPUT "    3. ADDR LINE 2 : ";A$:LSET A2$=A$
110 LINE INPUT "    4. ZIP CODE    : ";A$:LSET ZP$=A$
115 LINE INPUT "    5. PHONE       : ";A$:LSET TL$=A$
120 LINE INPUT "    6. CONTACT     : ";A$:LSET CT$=A$
130 LINE INPUT "    7. POSITION    : ";A$:LSET P$=A$
140 LINE INPUT "    8. CODE        : ";A$:CD=VAL(A$)
150 LINE INPUT "    9. COMMENT     ";A$:LSET CM$=A$
155 '
      DISPLAY RECORD - IF OK UPDATE FILE; IF NOT
       SET SWITCH (S$) AND GOTO CHANGE ROUTINE

160 CLS: GOSUB 11000:YN$="Y": INPUT "AOK";YN$:
        IF YN$="N" THEN S$="A":GOTO 210
170 GOSUB 12000: GOTO 50

200 '
       ********************
       CHANGE A RECORD
       ********************

205 GOSUB13000: IF K=0 GOTO 20 ELSE GOSUB 10000
210 CLS: GOSUB 11000:I=0: INPUT "WHAT FIELD TO CHANGE";I
214 '
       IF NO MORE CHANGES THEN
       PUT RECORD TO FILE - IF WE CAME FROM ADD ROUTINE
       GO BACK THERE, ELSE GOTO MENU

215 IF I=0 GOSUB12000:
        IF S$="A" GOTO 60 ELSE GOTO 20
220 IF I<1 OR I>10 GOTO 210
225 '
       GET NEW INFO AND UPDATE RECORD IN BUFFER

230 PRINT "WHAT'S NEW INFO...: ";I;".  ";:LINE INPUT A$
235 ON I GOTO 240,250,260,270,280,290,295,300,310,320
240 LSET CN$=A$: GOTO 210
```

```
600 A$="        :"+A1$+"      "+"POSITION     :"+Q$:LPRINT A$
610 A$="        :"+A2$+" "+ZP$+"       "+"PROSPECT CODE:"+
      STR$(CD):LPRINT A$
620 A$="PHONE   :"+"("+LEFT$(TL$,3)+")"
   +MID$(TL$,4,3)+"-"+RIGHT$(TL$,4)+STRING$(18," ")
   +"COMMENT      :"+CM$:LPRINT A$
630 FOR I=1TO4:LPRINTCHR$(32):NEXTI
635 '
       TIME FOR TOP OF FORM ?

640 NN=NN+1: IF NN=6 THEN GOTO 650 ELSE GOTO 660
650 NN=0:PG=PG+1:LPRINT CHR$(11):LPRINT PP$;
   STRING$(50-LEN(PP$)," ");"PAGE";PG:LPRINT" "
660 E=0:NEXT K: GOTO 20
700 '
       ******************
       LIST ON CRT
       ******************

710 A$="CRT":GOSUB 14000
720 '
       DISPLAY LOOP

725 FOR K = LO TO HI
730 GOSUB 10000: IF DC$="D" GOTO 750
740 GOSUB 11000: PRINT: PRINT:LINE INPUT YN$
744 '
       IF USER HITS "S" INSTEAD OF ENTER, EXIT LOOP

745 IF YN$="S" THEN GOTO 20
750 NEXT K: GOTO 20
799 '
       ********************
       DISPLAY COMPANY NAMES AND CONTACTS
       ********************

800 CLS:PRINT@74,"LIST NAMES & CONTACTS":GOSUB14010
810 PRINT"TURN PRINTER ON...HIT ENTER...";:LINE INPUT YN$
820 LPRINT CHR$(11):PRINT "ALIGN PAPER...HIT ENTER...";:
      LINEINPUTYN$
830 PG=1:NN=0:INPUT "WHAT'S HEADING";PP$
    :LPRINT PP$;STRING$(50-LEN(PP$)," ");"PAGE ";PG:LPRINT" "
835 ON ERROR GOTO 20000
```

```
837 '
       PRINT LOOP

840 FOR K=LO TO HI:GOSUB 10000: IF DC$="D" GOTO 870
850 P$=RIGHT$("  "+STR$(K),3)+")  "+CN$+"    "+CT$:LPRINTP$
854 '
       TIME FOR TOP OF FORM ?

855 NN=NN+1:IF NN<50 GOTO 870
860 NN=0:PG=PG+1:LPRINT CHR$(11):LPRINT PP$;STRING$(50-LEN(PP$)," ");"PAGE ";PG
870 E=0:NEXT K:GOTO20
899 '
       ********************
       PRINT MAILING LABELS
       ********************

900 CLS:PRINT@74,"LABELS":PRINT:GOSUB 14010
905 PRINT"LOAD LABELS...HIT ENTER...":LINE INPUTYN$
909 '
       TEST LOOP - PRINT A LABEL OF X'S UNTIL LABELS
       ARE LINES UP CORRECTLY

910 FOR I=1TO5:LPRINT STRING$(30,"X"):NEXTI:LPRINT" ":
       INPUT"AOK";YN$
920 IF YN$="N" GOTO 910
923 ON ERROR GOTO 20000
924 '
       PRINT LOOP

925 FOR K=LO TO HI:GOSUB 10000:IF DC$="D" GOTO 980
930 LPRINT CN$:LPRINT A1$:LPRINT A2$;"  ";ZP$:LPRINT" ":
       LPRINT"ATTN: ";CT$:LPRINT" "
980 E=0:NEXT K:GOTO 20
999 '
       ********************
       END OF PROCESSING - CLOSE FILE
       ********************

1000 CLOSE:END
10000 '
       ********************
       GET RECORD
       ********************

13999 '
       ********************
       GET LOW AND HIGH RECORD NUMBERS
       ********************

14000 CLS: PRINT@74,"LIST NAMES AND ADDRESSES ON ";A$:PRINT
14005 '
14010 INPUT "WHAT IS STARTING RECORD";LO
14020 INPUT "WHAT IS ENDING RECORD";HI
14030 IF LO>HI GOTO 14000 ELSE RETURN
19999 '
       ********************
       ERROR PROCESSING ROUTINE
       CLOSES FILE AND HALTS PROCESSING IF
       DISC ERROR OCCURS TEN TIMES IN A ROW
       ********************

20000 E=E+1:PRINT E;") ERR=";ERR;" ERL=";ERL
20010 IF E>10 THEN CLOSE:STOP ELSE RESUME
```

LISTING 2

```
0 '
       REORGANIZE A MAILING LIST FILE PROGRAM BY:
       ROCKY SMOLIN  LA JOLLA,CA
5 CLEAR 10000:DIM N$(650),X(650),Y(650):Z$="ZZZZZZZZZZ"
6 '
       HOUSEKEEPING - GET FILE NAME AND DRIVE: OPEN
              INPUT AND OUTPUT FILES; GET HIGH RECORD
              NUMBER

10 INPUT "FILE NAME";F$:INPUT"DRIVE";D$:F$=F$+":"+D$:
      F=1:S=1:P=1
15 INPUT "HIGHEST RECORD NUMBER";HI
20 OPEN "R",1,F$:OPEN "R",2,"NEW:0"
25 '
       READ RECORDS IN SEQUENCE AND STORE THE FIRST TEN
       CHARACTERS OF THE COMPANY NAME IN N;
       IGNORE DELETED RECORDS (DC$="D")

30 FOR K=1 TO HI: GOSUB 10000: IF DC$<>"D" AND ASC(DC$)<>0
        THEN N$(S)=LEFT$(CN$,10):X(S)=K:S=S+1
40 PRINT S,K:NEXTK
50 S=S-1:IF S=0 THEN PRINT "S=00":STOP
55 '
```

```
10001 ' GET RECORD
10002 '
       L = SECTOR NUMBER
       M = DISPLACEMENT TO DESIRED RECORD WITHIN SECTOR
       K = LOGICAL RECORD NUMBER

10010 N=L: L=FIX((K-1)/2)+1: IF N<>L THEN GET 1,L
10015 M=K-2*INT((K-1)/2)-1
10020 FIELD 1,M*128 AS D$, 1 AS DC$, 30 AS CN$, 25 AS A1$,
             18 AS A2$, 5 AS ZP$, 10 AS TL$, 20 AS CT$,
             1 AS P$, 2 AS CD$, 15 AS CM$
10030 CD=CVI(CD$): RETURN
11000 '
       ************"*******
       DISPLAY RECORD
       **********************

11010 PRINT:PRINTTAB(10)"RECORD NUMBER :";K:PRINT
11020 PRINT TAB(10)"1. COMPANY NAME : ";CN$
11030 PRINT TAB(10)"2. ADDRESS      : ";A1$
11040 PRINT TAB(10)"3.              : ";A2$
11050 PRINT TAB(10)"4. ZIP CODE     : ";ZP$
11060 PRINT TAB(10)"5. TELEPHONE    : ";"(";LEFT$(TL$,3);
       ") ";MID$(TL$,4,3);"-";RIGHT$(TL$,4)
11070 PRINT TAB(10)"6. CONTACT      : ";CT$
11080 PRINT TAB(10)"7. POSITION     : ";P$;"  ";P$(VAL(P$))
11090 PRINT TAB(10)"8. PROSPECT CODE: ";CD
11100 PRINT TAB(10)"9. COMMENTS     : ";CM$
11110 PRINT TAB(9)"10. DELETE CODE  : ";DC$
11120 RETURN
12000 '
       **********************
       PUT RECORD
       **********************

12010 LSET CD$=MKI$(CD): PUT 1,L: RETURN
13000 '
       **********************
       GET RECORD NUMBER
       **********************

13010 LK=K:CLS:PRINT@10,"LAST RECORD = ";K:
       PRINT@74,"RECORD NUMBER : ";:LINE INPUT K$:
       K=VAL(K$):IF K>650 GOTO 13010 ELSE RETURN
```

```
       ALPHABETIZE BY SCANNING N$ ARRAY AND FINDING LOWEST
       VALUE; THEN TAKE RECORD NUMBER OF THIS LOWEST RECORD
       AND PUT IT INTO Y(I)

60 FOR I=1TOS:B$=Z$:K=0:R=1
70 FOR J=1TOS:IF N$(J)<N$(R) THEN R=J
71 NEXT J
72 IF N$(R)=Z$ THEN I=I-1:GOTO80
76 Y(I)=X(R):PRINT I,N$(R),X(R):N$(R)=Z$:NEXTI:I=I-1
78 '
       NOW GO BACK AND, USING THE SEQUENCE OF RECORD NUM-
       BERS THAT APPEARS IN Y, READ THE SOURCE FILE IN
       ALPHABETICAL ORDER AND OUTPUT TO NEW:0

80 FOR II=1TOI:K=Y(II):F=1:GOSUB10000
90 F0$=DC$:F1$=CN$:F2$=A1$:F3$=ZP$:F4$=TL$:
  F5$=CT$:F6$=P$:F7=CD:F8$=CM$:FX$=A2$
100 F=2:K=II:GOSUB10000
110 LSET DC$=F0$:LSET CN$=F1$:LSET A1$=F2$: LSET ZP$=F3$:
       LSET TL$=F4$:LSET CT$=F5$:LSET P$=F6$:CD=F7:
       LSETCM$=F8$:LSETA2$=FX$
120 GOSUB 12000:PRINT II,CN$:NEXTII
125 '
       END OF PROGRAM - REORGED FILE NOW APPEARS ON
       DRIVE 0 WITH NAME "NEW" - SIMPLE, YES ????

130 CLOSE:STOP
10000 '
       **********************
       GET RECORD
       **********************

10005 IF K>650 GOTO 800
10010 L=FIX((K-1)/2)+1:GET F,L
10015 M=K-2*INT((K-1)/2)-1
10020 FIELD F,M*128 AS D$, 1 AS DC$, 30 AS CN$, 25 AS A1$,
             18 AS A2$, 5 AS ZP$, 10 AS TL$, 20 AS CT$,
             1 AS P$, 2 AS CD$, 15 AS CM$
10030 CD=CVI(CD$): RETURN
12000 '
       **********************
       PUT RECORD
       **********************

12010 LSET CD$=MKI$(CD): PUT F,L: RETURN
```

Electronic Mail Is Here

By Carl Warren

The world was stunned when Samuel Morse first demonstrated that messages could be sent over wires using electric impulses. That invention of the telegraph marked the beginning of the information explosion. Within months after Morse's invention was first shown to the world, plans were made to link every inch of America. The age of fast mail was here.

As time went by, other inventions enhanced this new way of communicating. First, there was the radio, then the television. The past few years have given us satellite communication, and the world has grown smaller still.

People talk about the new age when everyone will be able to communicate with any spot on the world from the comfort of his easy chair for just a few pennies. The imagination runs wild at the prospect of having huge databases available on everything from car rentals to the New York Stock Exchange. Everyday people wonder when this will happen. Is it just around the corner?

Not any longer. This past June 4th at the National Computer Conference in New York City, a new concept in personal communication was introduced in the form of the Source.

THE SOURCE AND PERSONAL COMMUNICATION

The Source is a time-sharing network geared to provide the average person with direct access to a major computer system for a minimal cost. The system not only provides communication from a user to the computer, but also direct communication with other users at the same time. Sounds like a very sophisticated telephone, which in actuality it is.

The Source is a direct outgrowth of large time-sharing operations that are used by major corporations for querying databases and switching messages. Telecomputing Corporation of America (TCA) makes available to anyone the same computer used by major corporations during the day. The general public can now use the service after prime time usage hours for a fraction of the cost which is normally associated with time-sharing operations.

The system, which uses a prime computer as the mainframe, offers a nationwide network through time-sharing ports operated by Tymnet and Telenet. By offering the service through these two data traffic networks, users can access the computer located in McLean, Virginia, by dialing local phone numbers from virtually any point in the United States.

```
                    *** THE SOURCE ***

ANNOUNCEMENTS (UPDATED FREQUENTLY).....DATA ANNOUN

ADVANCED APPLICATIONS & PROGRAMS.....DATA ADAPPR
ASTROLOGY LIBRARY (THE).....DATA ASTRO-LIB
BUSINESS & FINANCE.....BIZDEX
CLASSIFIED ADS & BULLETIN BOARD.....DATA CLASSI
CONSUMER INFORMATION.....DATA CONSUM
DINING OUT.....RESTGD
DISCOUNT SHOPPING SERVICE (MONEY SAVERS).....DATA BUCKS
EDUCATION.....DATA EDUCAT
ENERGY SAVING NEWS & TIPS.....ENERGY
FINANCIAL NEWS.....BIZDEX
GAMES.....DATA GAMES
MAILCALL.....DATA MAILCALL
NEW YORK TIMES - NEWS SUMMARY.....DATA NYTNS
NEW YORK TIMES - CONSUMER DATA BASE.....NYTIMES
ORACLE - ASK ANY QUESTION ON ANY SUBJECT.....DATA ORACLE
PERSONAL CALENDAR & NOTEBOOK.....DATA PERSON
PERSONAL FINANCE.....DATA PERSFI
REAL ESTATE ADVISORY (REAL-SOURCE, INC.).....DATA REALAD
SCIENCE & ENGINEERING.....DATA SCIENG
(PRESS THE RETURN KEY TO CONTINUE, OR "BREAK" TO SELECT A CATEGORY)

SPORTS.....DATA SPORTS
SUGGESTION BOX.....DATA SUGBOX
SYSTEM NEWS.....DATA SYSNEW
TRAVEL CLUB.....DATA TRAVEL
UNITED PRESS INTERNATIONAL (UPI).....DATA DANEWS
USER DIRECTORY.....DATA USEDIR
VOICEGRAM.....DATA VOICEGRAM
WEATHER.....DATA WEATHR
WISDOM OF THE AGES.....WISDOM
```

Figure 1.

Courtesy of Telecomputing Corporation of America through the Source

The Source service cost is a $100 one-time subscription fee, and $2.75 an hour after six p.m. local time. There are additional costs for prime time hours and special services. The service offers the average user just about every data processing function that one could think of. Some of the functions are shown in the menu in Figure 1. Notice that for the price of a phone call and less than you probably spend for lunch each day, information on subjects from astrology to wisdom can be obtained from the Source network.

One of the exciting features of the source system is the Voicegram function. Using this system, a message can be left on the system by calling and speaking directly to the computer, then directing it to any other user, or specified addresses. This way businessmen who subscribe to the system can make use of it with or without a terminal to send valuable information back to the office or to an important client.

The big plus of the system is that it is an information supermarket. This becomes even more important daily as the world grows more and more complex and information makes the difference between profit and loss or in some cases life and death.

All of this probably sounds fairly familiar, and it is. All that I have said so far is very similar to what I and others wrote about the new citizens band market just a few years ago. The parallels are pretty much the same; low cost communication for the masses, access to important information, and so on. Like the CB phenomenon, the Source is primarily appealing to the home computer hobbyist. This is true even though the micro industry is touting the fact that every day more and more average men and women are purchasing microcomputers.

Although the Source does offer some very important and unique information sources, it appears after approximately six months of operation that its greatest impact is for sending fun messages between users. After using the system for approximately two weeks, I have found that message switching and the chewing of the rag — an old ham term meaning shooting the breeze — seems to me to be extremely popular. Already the system is populated with pseudo-experts, real experts, and a few strange folks just like those on citizen band radio frequencies.

Even though the immediate appeal of the system may be the message switching function called MAILCALL or CHATTING, the operators of the Source feel that by 1982 over 100,000 users will be taking advantage of the information resources available on the system. This, of course, is based on the supposition that the average man will be interested in seeing up-to-the-minute news, weather and sports. Sure television offers the same service, but not as quickly as the Source is able to. Also, you can't use your television to find a good deal on stereos, books or your airplane tickets for that trip to Hawaii. On the Source, you can.

OPERATION OF THE SOURCE

The main computer system used by the Source is located in Virginia and is a nationwide network system handled by Tymnet and Telenet, connecting users and the system together. Because of this, there are two protocols required, the one needed by Tymnet or Telenet, and the necessary input codes for the Source.

The system operates at 300 baud and 30 characters per second, using one stop bit and with no parity checking. Operating in full duplex, the Source echoes each character transmitted to it back to the user.

Those who use the system can do so with a terminal and an acoustic coupled modem. Or for more sophistication, a microcomputer such as the Apple equipped with an on-

Name	Type	Description
ANNUIT	Busn	Analysis of payment or withdrawl annuities *
BALSHT	Busn	Calculates a simple PROFORMA income statement
BNDPRC	Busn	Computes the price of accrued interest for a bond
BNDYLD	Busn	Computes the after tax yield to maturity of a bond
CKBAL	Busn	Balances a checking account
CSHFLO	Busn	Computes the present values of up to four cash flows
DEPCOM	Busn	Computes and prints a depreciation by months
EQUITY	Busn	Computes the cost of equity capital
INOUT	Busn	Simulates the inter-industry flow of goods and services
LAMORT	Busn	Computes a table for a loan amortization schedule
LDEBTS	Busn	Computes monthly payments on simple anuity debts
LINTRT	Busn	Computes annual interest rate on an installment loan
LMORTG	Busn	Computes the amortization of house payments
LORB	Busn	Compares cost of leasing vs. purchasing equipment
MKBUY	Busn	Compares cost of buying vs. producing a component
MORGAG	Busn	Computes missing variable of a mortgage analysis
SALES	Busn	Generates a sales commision report
YRMORT	Busn	Generates a loan amortization schedule table
CHAT	Cmnd	Inter-user conversation
DDC	Cmnd	Program debugger
MAIL	Cmnd	Private Mail (Inter-user)
MAILCK	Cmnd	Check for incoming Private Mail
POST	Cmnd	Public mail
XFTN	Cmnd	Extended fortran
BEAMD	Ensn*	Computes the moment of inertia for beams
FILTER	Ensn*	Designs a 5-element passive L-C filter
LFILTR	Ensn*	Computes the capacitor values for low pass filters
LMOLEC	Ensn*	Computes thickness of a molecule in angstroms
LTORQ	Ensn*	Computes the sum torque acting on a lever
OHM	Ensn	Computes amperage using Ohm's law
OHM2	Ensn	Computes current using Ohm's law
SMITHC	Ensn*	Solves lossless rf transmission line problems
*TREK	Game	Expanded version of the Star-Trek game
ADVENTURE	Game	Adventure (Unique and adicting)
BLACKJACK	Game	Casino style 21
CIVILWAR	Game	Civil War simulation against the computer
COIN	Game	Coin flipping
CRAPS	Game	Shoot craps
DATES	Game	Statistics concerning a particular date
FOOTBALL	Game	Monday night Football
GOLF	Game	Golf for one or more players
HANGMAN	Game	Hangman word game
HORSE	Game	Horse Race game
IQTEST	Game	IQ game of skill
LGOLF	Game	Large game of golf

Figure 2.

board modem and special software that dials the Source and inserts the necessary codes to establish communications can be used. This particular function, along with the necessary software for 8080/Z-80 systems, will be presented in the March issue.

Software designers looking for a large system to develop important programs on can use the Source to work with BASIC, FORTRAN, Pascal and a variety of assemblers. Should software not be your bag, but say book writing is and a huge storage area is required, the function exists on the Source. For all practical purposes, there is something for everybody.

Examples of some of the extra functions found on the system are shown in Figure 2. The functions presented are just a few examples of some of the existing programs already available to a user. Businessmen will be glad to know that the system has very exciting business packages available which can be used to run your business. Of course, there are charges for maintaining data files with your unique information, but they are still lower than other time-sharing offerings currently available.

Table 1. Source Costs

One time subscription fee	$100
Connect time after 6 p.m. local	$2.75 per hour
Connect time prior to 6 p.m. local	$15.00 per hour
System time	No CPU charges

Storage costs (Based on blocks. One block is equal to 2048 characters) . . . . . 3.3 cents per block
This cost is averaged out over a month for average number of files.

Messages are free for ten days. After ten days they become a block of storage and are included in the average storage costs. This forces the user to save or delete them.

Connect time is computed on full minutes and fractions. When the user ends the call on a fraction of a minute, the charges are computed to the last whole number.

Other charges for special functions such as BASIC programming are identified to users when they request the system. Basically these charges are $15.00 per hour regardless of time of day, and require a special account number.

Table 2. Programming Manuals and Reference Guides

The following system documentation can be ordered by subscribers who wish to explore the data processing capabilities of the prime computer:

Manuals and Reference Guides	PRICE
BASIC/VM Programmer's Guide (Note: Users writing BASIC programs requiring the use of more than 64K of memory must apply for a special account number and will be charged $15 per hour regardless of the time of day)	$19.95
COBOL Programmer's Guide	$19.95
FORTRAN Programmer's Guide (Note: Users writing FORTRAN programs requiring the use of more than 64K of memory must apply for a special account number and will be charged $15 per hour regardless of the time of day)	$19.95
Multiplex Index Data Access System (MIDAS) Reference Guide	$14.95
PMA Programmer's Guide (Assembly Language)	$19.95
Introduction to PRIMECOM	$ 5.00
RPG II Programmer's Guide	$19.95
Statistical Package for the Social Sciences	$14.95
System Architecture & Instructions Reference Guide	$19.95

To order documentation, contact the customer service department, TCA088. Please specify the following:

1. Title of Manual
2. Credit Card Type/Number
3. Credit Card Expiration Date
4. Your Name
5. Your Mailing Address and Zip Code

Orders for manuals will not be honored without the above information. Please allow ten days for delivery.

Interestingly enough, news services can use the Source for filing stories with the home office, and communicating with remote editors.

A GRASS ROOTS SURVEY

When I got involved with using the Source and talking with the folks that make it available, I was quite naturally excited over the prospects. But I represent one of those folks who like computers and the use of electronic technology to perform tasks that I don't like to do very much. Since the Source is designed to be everyman's system, I felt that it was only fair to find out what the general feelings were regarding electronic mail and the ability to use large databases. To do this, I went to several local computer stores, including several Radio Shack stores, plus a local shopping mall. What I learned was really not surprising, but it did indicate that we have a way to go before full acceptance is met.

At the computer stores, I talked to people who obviously had an interest in computers. You usually don't hang around a store at seven o'clock at night and discuss the attributes of an 8085 if you don't. These folks were, of course, all in favor of a system like the Source, and some had already subscribed. Just about all of them felt it was filling a big gap in the use of computers. Interestingly enough, of the ten men I talked to, all were either hams or citizens band radio operators.

The folks that I talked to at the shopping mall and the Radio Shack store were oriented differently. Of the ten I talked

Continued on Page 144

Interfacing the MC6840 to the Commodore PET 2001

By M.F. Smith

The Motorola MC6840 Programmable Timer Module (PTM) is a 28-pin package containing three independent 16-bit timer/counter circuits and capable of operation to 4 MHz. These circuits may be used as frequency generators with programmable duty cycles, event counters, frequency counters and programmable width pulse generators. Combined with a processor operating under a high-level language, such as the Commodore PET 2001, a single MC6840 can become an inexpensive and powerful laboratory instrument.

The MC6840 interface (Figure 1) is straightforward and uses only two integrated circuit packages. The interface and the MC6840 are mounted on a small wire-wrap board which plugs directly into the PET's memory expansion connector. In order to provide +5 volts to the circuit, a wire is connected from the PET +5-volt supply to pins 13-15 of the memory expansion connector.

Software for the MC6840 can be written entirely in BASIC, making use of the PEEK, POKE and WAIT instructions. Automatic binary/decimal conversion with PEEK and POKE particularly simplifies use of the MC6840 with the PET.

Routines for frequency generation (Listing 1) and period/frequency counting (Listing 2) are shown. These routines are most suitable for audio-frequency range since resolution at 1KHz is about 1Hz, resolution at 10KHz is 100Hz and so on.

To use the counter for higher frequencies, it is necessary to divide the signal using hardware counters or to use one channel of the 6840 to gate another channel for true frequency counting. Use the 6840 to generate a 1-second gate signal with another channel.

Typical applications for the combination are general-purpose laboratory instruments, programmable baud generators, frequency sweep generators, frequency analyzers, musical instruments, etc. The main limitation of the instrument is that the PET can do only about 100 PEEK/POKE operations per second which is no disadvantage for many applications. Incorporation of machine language subroutines could greatly speed operation for applications when this rate is too slow.□

PROGRAM LISTING 1

```
 10 GOSUB 2010
20 PRINT "CHANNEL, FREQ";:INPUT CH,FQ
30 GOSUB 1010 : GO TO 20
1000 REM
      OUTPUT A FREQUENCY ON MC6840
1010 IF CH>=0AND CH<=2 THEN 1030
1020 PRINT "NO SUCH CHANNEL":RETURN
1030 T4=CH*2+2:T5=T4+1:REM              OFFSET CHANNEL
1040 TG=TF/FQ:TE%=TG/TB%:POKE TA+T4 : REM SET MSB ON 6840
1050 TF%=TG-(TE%*TB%):POKE TA+T5,TF%: REM SET LSB
1060 RETURN
2000 REM
      INITIALISE THE MC6840 FOR OUTPUT
2010 RESTORE :TF=500000:TA=45072:REM    6840 ADR, CLK
2020 TB%=256
2030 FOR I=1 TO 11:READ TB,TC%:REM      GET INIT VALUES
2040 POKE TA+TB,TC% : NEXT I    :REM    POKE TO 6840
2050 RETURN
2060 DATA 1,0,0,130,1,1,0,130,1,130
2070 DATA 2,0,3,0,4,0,5,0,6,0,7,0
```

PROGRAM LISTING 2

```
10 PRINT "CHANNEL";:INPUT CH
20 GOSUB 2010
30 PRINT : GOSUB 1010 : GO TO 30
1000 REM
      READ MC6840 CHANNEL
1010 T4=CH*2+2:REM      OFFSET FOR CHANNEL
1020 WAIT TA+1,127      :REM    WAIT UNTIL 6840 READY
1030 P=PEEK(T4+TA)*TB%+PEEK(T5+TA)
1040 P=ABS(P-65536)
1050 P=1(P/TF):REM      INVERT PERIOD FOR FREQ
1060 PRINT :PRINT INT(P+.5);"HZ"
1070 RETURN
2000 REM
      INITIALISE 6840 FOR PERIOD COUNTING
2010 RESTORE :TF=1.00000E+06:REM          PET CLK=1 MHZ
2020 TA-45072:REM       6840 ADDRESS
2030 TB%=256
2040 FOR I=1 TO 20:READ TB,TC%:POKE TA+TB,TC%
2050 IF TB=999 THEN 2070
2060 NEXT I:REM INITIALISE 6840
2070 RETURN
2080 DATA 1,1,0,10,1,0,0,10,1,10,2,255,3,255
2090 DATA 4,255,5,255,6,255,7,255,999,9
```

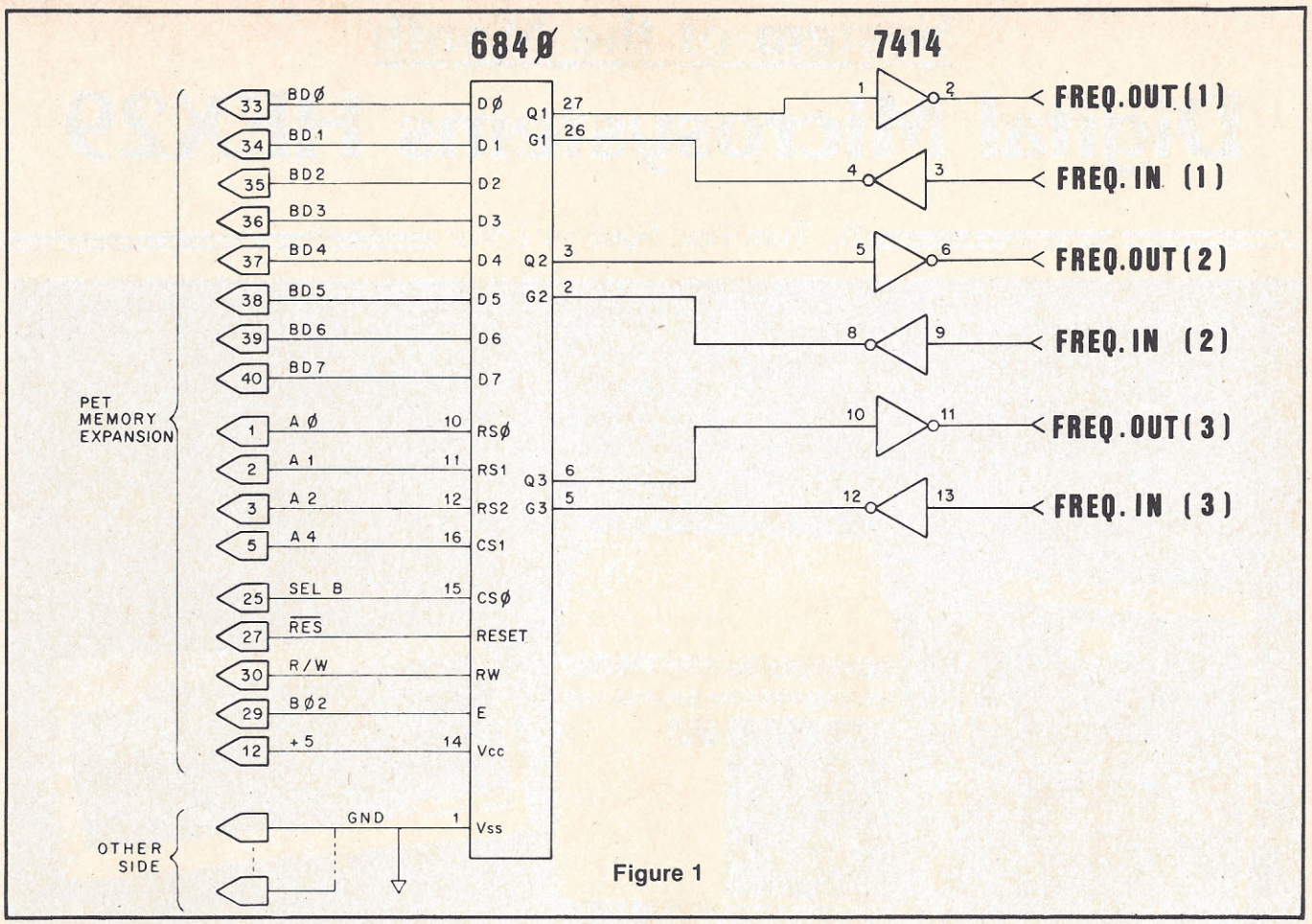
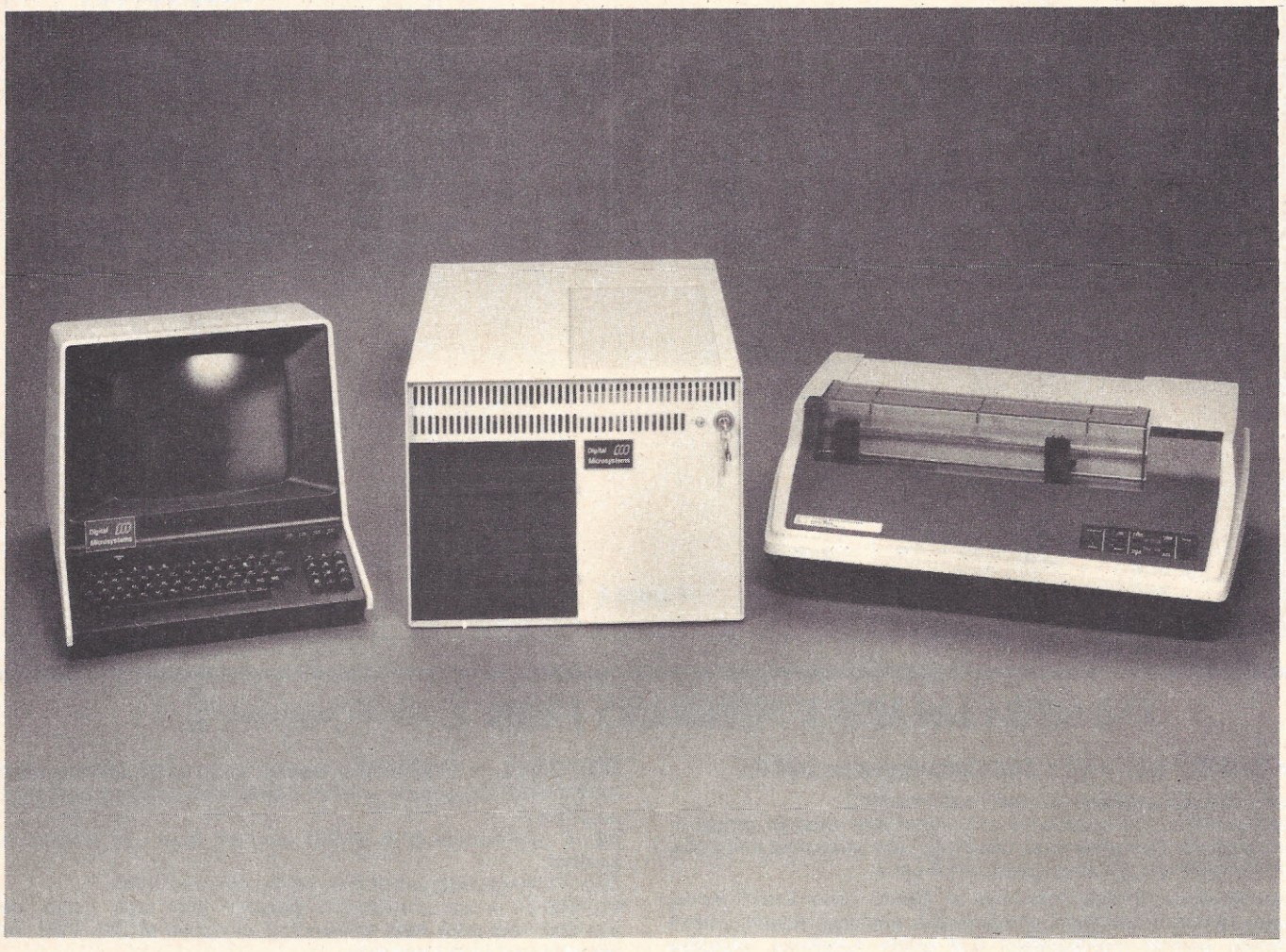


Figure 1

System of the Month

Digital Microsystems HEX29

By Tom Fox, Systems Editor



It is 9 AM, and already too hot in Carmel Valley. Seventy-five miles south of San Francisco, the narrow valley begins at the posh Pebble Beach golf course, meanders through the Santa Lucia mountain range and neatly loops around Uncle Sam Mountain and the elegant homes overlooking Big Sur. The morning air is still upon the brittle-dry forage of the horse ranches that dot the valley. Birdsong is a memory an hour old at the Holman Ranch, a spread whose ownership has remained in the same family since before California became a state.

Noticed by no one, a speck appears low in the southern sky, pushing a muttering motor sound ahead. With a suddenness that defies the lazy condition of the mid-morning stillness, the small airplane slips down the valley and circles the tiny airstrip hidden from the main road by tall clumps of pampas grass. The event is consummated as the wheels rattle onto the neglected surface and the machine grumbles to a deserted parking area, its propellers clipping great twin U-channels through the unmown grass. The valley once again returns to its slumber, little changed by the experience.

A footpath takes the intruder's sole occupant in the direction of the tall Post Office flagpole, where waits the expected car and driver. Strangers shake hands; the rendezvous is made.

Minutes later, the car negotiates a winding driveway to a rather ordinary ranch style home. The only hint that more than just living goes on inside is a hand-carved wooden sign propped in front. Resembling a headstone on Boot Hill, its message is brief and enigmatic: HEX29.

* * * * *

Thus we met the HEX29, a computer built on a premise as rare as its birthplace. Claiming to be the first to take advantage of a new generation of integrated circuits called "bit slices," the HEX29 promises minicomputer-class power at microcomputer prices. We've seen such claims before, but a peek at the specifications of this computer suggests that this time, the proclamation carries more substance than the familiar salesman's hype.

The HEX29 is a brand new design, one that will need seasoning before it finds a comfortable place in the business environment. The major reason for this is that applications software (payroll, accounts receivable, etc.) doesn't yet exist for this machine. We bring the HEX29 to your attention because of its extraordinary promise; it just may be the first of a generation of computers that gives the ubiquitous microcomputer some real competition in the small business marketplace.

HEX29 is a rather obscure name for those who do not know (or care) that the computer is based on a 16-bit archi-

tecture (thus HEXadecimal), and has been designed around the Advanced Micro Devices AMD2900 bit slice processor. A "bit slice" is an integrated circuit which can perform computing functions to — in this case — only four bits of data at a time. The AMD2900 has roughly the same complexity as the 8-bit Z80 microprocessor chip, thus it is no surprise that there is room for more power and sophistication in the bit slice version.

To build an 8-bit computer, two AMD2900s are connected together in parallel. The HEX29 uses four of these devices to achieve its 16-bit capabilities. In theory, a very large computer could be built by stacking many bit slices together. The AMD2900 is constructed with bipolar technology, as opposed to the MOS processes more common in the microcomputing world. Bipolar chips are generally faster and consume more power than the MOS variety.

SPEED DEMON

If the HEX29 has one pervasive design philosophy, it is "speed." Throughout the design, one can see many examples where operating speed is the primary goal, even though a penalty needs to be paid in terms of more complexity, greater cost, or more power consumption.

A dual floppy disk controller is offered which can support up to eight 8-inch floppy disk drives on each of its two independent data channels.

The basic machine cycle requires 160 nanoseconds. There are a thousand nanoseconds in each microsecond, which computes to a basic machine rate of 6.25 megaHertz. That's over three times as fast as the familiar 8080 chip, whose 8-bit design only handles half as much data during each cycle. In common with other computers, two or more machine cycles are required for nearly every useful instruction (add, compare, write into memory, etc.).

Thus the kinds of instructions offered are as important as the basic cycle rate of the hardware itself. A common operation such as adding two 16-bit numbers together can be handled at the rate of 2.5 million per second. Over 150,000 such numbers can be multiplied together in a second, a rate made possible by the hardware-implemented multiply and divide circuitry in the HEX29.

The instruction set is at least as powerful as minicomputer-size machines, and includes features you might only expect to see in higher-level languages. Something over 130 different instructions are available to operate on data which are defined as bits, nybbles (half-bytes), 8-bit bytes, 16-bit words, double and quad words, 64-bit floating point numbers and variable-length strings or lists. If expressed as a floating point, a number has a precision of 14 decimal digits, and can range from plus or minus 10 to the 4931st power. Even if you're counting the atoms in the universe, you couldn't overflow this machine!

The instructions which deal with data as lists are quite unusual, and are intended to make high-level languages such as Pascal easily and efficiently written for HEX29. For example, machine-language instructions exist to search through a list of words or bytes in memory, and stop when a particular pattern is found; or to cause the program to branch to a memory location indicated by the found pattern.

A similar capability exists for searching through a "linked" list. A linked list is a series of memory locations which are not necessarily contiguous (next to each other), but are linked together by "pointer" numbers contained as part of the preceding memory location. This is a very powerful way of organizing data in a computer; one which is almost never supported by instructions in the "natural" language of the computer itself.

THE HARDWARE PARTS

Digital Microsystems has chosen to design their own form factor and bus structure for the computer, feeling that performance of the machine is of paramount importance. The central processing unit (CPU) is contained on two 10" x 15" four-layer circuit cards on a 200-pin bus. One of the cards includes the four AMD2900 bit slices and their supporting circuitry, along with 12 kilobytes of read-only memory (ROM) containing the basic instruction set of the computer.

The second CPU card contains 30 kilobytes of random-access memory (RAM) for the "systems" software: disk operating system, memory management, multi-user scheduler, languages such as BASIC and the editor, etc. This second card also includes eight serial and eight parallel input/output (I/O) ports for terminals and printers. Add a power supply, and these two cards alone represent a potent computer needing no other supporting hardware for certain uses.

Most applications will need additional RAM and a means to read and write information onto a disk of some sort. The basic memory card for the HEX29 sports an amazing quarter megabyte (262,144 bytes) of dynamic memory. Up to four of these boards can be added, giving each of eight simultaneous operators 128 kilobytes of memory for their exclusive use. And since the "systems" software is contained on one of the CPU cards, all 128 kilobytes are available to each user.

The dynamic memory card is unusual in the microcomputing field in that each 16-bit memory location is blessed with an additional six bits whose sole purpose is to detect and even correct memory errors. Single-bit errors are automatically corrected "on the fly," and simultaneous errors in two of the 16 bits are detected and reported to the operating system software.

Such sophistication is expensive, but the industry is beginning to learn that even "perfect" memory chips can exhibit occasional errors due to the little-understood phenomenon of alpha particles. Alpha particles are emitted by trace radioactive impurities in the memory chips themselves, and are even blamed on cosmic rays!

Another memory operation is a 64-kilobyte static RAM card. Its operation is somewhat faster than the larger memory, but consumes more power and space for an equivalent amount of storage space.

A dual floppy disk controller is offered which can support up to eight 8-inch floppy disk drives on each of its two independent data channels. The controller is of the intelligent variety, requiring very little support from the CPU while moving information between the disks and memory. They utilize direct memory access (DMA) techniques, actually reading and writing to the memory between CPU operations in such a manner that the CPU itself is not slowed down while the disks are working. Up to two of these cards can be fitted to the HEX29, supporting a total of 32 floppy disk drives simultaneously.

Just emerging from the engineering laboratory is a controller for the Shugart SA-4000 14- or 28-megabyte Winchester disk drive. Down the road, we can expect to see a controller which can support up to 16 disks of the "storage module drive" (SMD) class. This unit will interface with the Century Data Hunter hard disk drives, ranging in size from 32 to 96 megabytes each.

The various cards are contained along with their power supply in a rather ordinary looking table-top box. Two floppy disk drives will fit into the same box.

The power supply is a "switcher"; one which regulates the voltages by switching the current on and off at a supersonic rate, instead of wasting power purposely in massive transistors and resistors. Switching power supplies are markedly more power efficient than ordinary series regulating ones, even though their complexity has resulted in generally lower reliability. You can find a switcher inside the Apple computer, too; that's the major reason why it is so small, light and cool.

THE SOFTWARE TOOLS

As we have mentioned, don't expect to find any General Ledger or finished word processing programs in the HEX29 software catalog. This computer represents a uniquely powerful potential, not a finished solution to the computing jobs that exist in the business world.

To realize such potential, the HEX29 has a capable operating system to handle tasks such as data transfers to and from the disks, as well as languages, editors and debugging tools that will allow programmers to come up with application-specific programs. All of this machine's software capabilities are built on HOST, a multi-user, multi-tasking disk operating system. HOST is married to some unique memory-management capabilities built into the hardware to provide absolute security between the system users. It supports random and sequential file types, communications between users and multiple tasks for each user.

All files are automatically backed up when they are altered, and version numbers retained. Files can be read- and write-protected from other users.

The data files and their directories are handled in a well thought-out fashion. All files are automatically backed up when they are altered, and version numbers retained. Files can be selectively read- and write-protected from other users, and a line of text entered by the creator of the file is kept in the directory to identify it more readily.

There are only a dozen or so distinct HOST commands (ERASE, COPY, SET TIME, etc.), but they incorporate such features as wild card file searching to increase their flexibility. In contrast with other systems with sophisticated operating systems (the Alpha Micro comes to mind), HOST commands are retained in electronic memory at all times, and don't have to be called from the disk each time they are executed. This results in responses to commands that are so fast it seems the HEX29 is anticipating your needs almost before you touch the keyboard.

The machine language described with the hardware, above, is supported by an assembler and linking loader called HAL and a text editor (HEXED) for entering the source programs. HEXED is a straightforward line editor bearing an eerie resemblance to Digital Equipment's TECO. An enhancement is in the works to display a complete screen of information while editing, with a stripped-down set of TECO commands to manipulate the characters.

Pascal is the most important language on the HEX29, a claim supported by the fact that two of the system's high-

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level languages (FORTRAN and a good part of Pascal itself) were originally written in Pascal. As implemented on this machine, Pascal is unique. Once a program is written in this language, it is compiled to result in the source listing of a HAL program — with entries in the comment field, if you can believe it. (We've seen it.)

The program must be then run through the HAL assembler, and then becomes a machine-executable program indistinguishable from one originally written in assembly language. The power of such an approach is evident. You can write programs in high-level structured Pascal, and never have the feeling that a program written in machine language would do a better job, as is the case with most other computers.

HBASIC+ is implemented as an interpreter, which is a surprise since interpreters have always been regarded as slower than compilers. The HEX29 hardware, however, has such a great native speed that HBASIC+ need make no apologies on this account.

Using an identical benchmark program that computes all the prime numbers from one to 1000, we saw the HEX29/HBASIC+ team finish 16 times faster than a four-mega-Hertz Z80-based microprocessor using a compiled CBASIC program running under CP/M. Table 1 shows speed comparisons with some other popular computers, large and small.

Table 1. Comparative times to compute all prime numbers up to 1000. Supplied by manufacturer.

COMPUTER	TIME
DEC PDP 11/70	45 seconds
HEX29	143 seconds
DEC PDP 11/45	330 seconds
DEC PDP 11/20	1140 seconds
IBM 5110	1620 seconds
Z80	2400 seconds
IBM 5100	3720 seconds

The writers of HBASIC+ have attempted to incorporate all the features of every popular variant of BASIC. This is a neat trick, frustrated by the fact that many versions of BASIC have conflicting enhancements. The intent of this ambitious maneuver is to allow the easy conversion of a variety of existing BASIC programs onto the HEX29.

The other language discussed by Digital Microsystems is FORTRAN 77, the latest standard incarnation of this venerable workhorse. FORTRAN should be available in a few months, along with a library of HAL subroutines to assist programmers in any language.

THE HIDDEN HEX

Although conceived in a remote Carmel Valley hideaway, the HEX29 is being produced and marketed by Digital Microsystems of Oakland, California. Mention either name to your local computer store salesman, and you will likely be rewarded with a blank stare. Even though Digital Microsystems was a pioneer in floppy disk-based microcomputer systems, they have chosen until now to leave the small business computer area to others. If they are as skilled in developing a consumer-oriented dealer network as they are in picking powerhouse computer designs, we can expect to hear a lot more from them in the future.

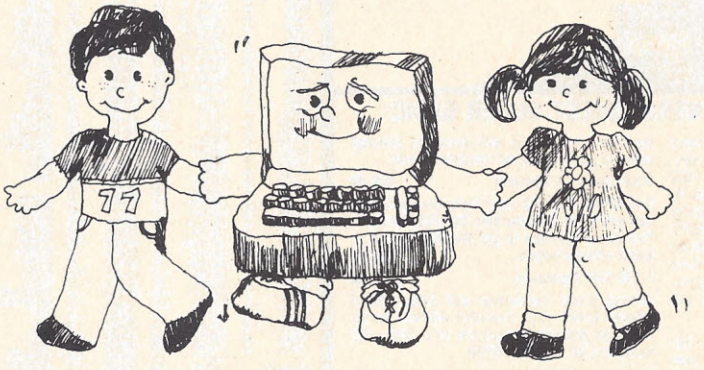
A basic HEX29, including the two CPU cards, power supply, enclosure, a disk controller fitted with one channel and a pair of Shugart SA-800 floppy disk drives (single-side, single density) lists for $10,950. This also includes all of the software discussed above except Pascal and FORTRAN, along with their source listings — an unusual touch.

The quarter-megabyte and 64-kilobyte memory cards sell for $4950 and $2950, respectively. Don't forget to include the cost of a CRT terminal and printer — $2500 and up for a typical pair — when figuring the total system price.□

My TRS-80 Likes Me

When I Teach Kids How to Use It

Part 5



By Bob Albrecht

TRS-80 PICKS A PATTERN

Last time, we began our number pattern series with simple arithmetic sequences (or progressions, or whatever they are called today), in which the FIRST NUMBER and the ADD-ON number were entered by the user. A sample RUN of our program from last time might look like this.

```
FIRST NUMBER? 1
ADD-ON NUMBER? 2
 1
 3
 5
 7
FIRST NUMBER?
```

After each number, we guess the next number then press the space bar to see the next number.

Ho hum. . .we press Q (for Quit)

Now, if we wish, someone can enter the FIRST NUMBER and ADD-ON NUMBER for another pattern.

This program is OK if one person (teacher? parent? peer?) enters the FIRST NUMBER and the ADD-ON NUMBER and another person (child? student? learner?) plays the "game." But the one person (teacher? parent? peer?) must always hover near the computer to start things again, when the second person (child? student? learner?) sees the pattern and gets bored.

Let's rewrite the program so that the TRS-80 picks the FIRST NUMBER and the ADD-ON number, at *random* between limits.

```
100 REM***NUMBER PATTERNS #2
200 REM***COMPUTE FIRST NUMBER (S) AND ADD-ON NUMBER (A)
210 S=RND(10)
220 A=RND(10)
230 CLS
300 REM***SHOW THE 'LATEST' NUMBER, S
310 PRINT S
400 REM***WAIT FOR KEY PRESS, 'SPACE' OR 'Q'
410 KEY$=INKEY$ : IF KEY$="" THEN 410
420 IF KEY$=" " THEN 510
430 IF KEY$="Q" THEN 210 ELSE 410
500 REM***COMPUTE NEXT NUMBER IN PATTERN
510 S=S+A
520 GOTO 310
999 END
```

This program is much like NUMBER PATTERNS #1 except that the pattern is defined by the TRS-80, in lines 210 and 220.

210 S=RND(10) — The FIRST NUMBER (S) is a random integer, 1 to 10.

220 A=RND(10) — The ADD-ON NUMBER (A) is a random integer, 1 to 10.

If you don't like our limits (1 to 10), change them! Enter the program and type RUN. The TRS-80 picks a random pattern. Well, not really. The *pattern* isn't random. Instead, the two numbers that define the pattern are random, within limits ($1 \leq S \leq 10$ and $1 \leq A \leq 10$). The pattern, once the two defining numbers have been chosen, is completely determined.

Anyhow, after you type RUN, the first number in the pattern chosen by the TRS-80 appears on the screen.

- To see another number in the pattern (sequence), press the space bar.
- To scrub this pattern and get a new pattern, press the Q key.

These patterns are for people who have little or no experience in guessing the next number in a pattern, or *sequence.* We hope that playing this game, activity, recreation (or whatever you wish to call it) will help people enjoy number patterns.

As we go on, we will introduce more challenging patterns. If this stuff seems too easy, be patient — we will slowly move from easy to harder to awful! The ride will be slow and easy.

You, of course, can easily change our program so that it presents geometric sequences (progressions?) instead of arithmetic sequences (progressions?). You need change only line 510 to: 510 S=S*A

Please remember, this series is only an *outline* of things to do, things to try. Our programs are bare bones. We assume that *you,* the teacher, parent, friend, are right there explaining how to use our simple programs. *You* are there to help when something goes wrong.

If you are a teacher, we encourage you to find a 10-year-old teaching aid (or 9, or 11, or whatever age you have available) to do the stuff in the preceding paragraph. Your TA will love it and their students will love it. Find as many TAs as

possible; you might suddenly find that "kids teaching kids" lets you relax and enjoy your classroom as never before — you can then help kids learn as you have never been able to do before. Your TRS-80 suddenly becomes a TA, always there, always ready to work.

OK, back to number patterns. Perhaps you have a plan in mind — a pattern of patterns, or a sequence of sequences. You would like your student, child or friend to experience first this pattern, then another, yet another. You have a plan which begins with easy patterns, then slightly more difficult, then more difficult, then. . .well, after all, it *is your* plan. Do it your way.

Instead of letting the TRS-80 select number patterns, you can prescribe a sequence of patterns. The following program allows you to do this. All *you* have to do is rewrite the DATA statements so that *your* plan replaces ours.

```
100 REM***NUMBER PATTERNS #3
110 CLS
200 REM***READ FIRST NUMBER (S) AND ADD-ON NUMBER (A)
210 READ S,A
220 IF S=1E37 THEN PRINT "I'M OUT OF PATTERNS" : END
300 REM***SHOW THE 'LATEST' NUMBER, S
310 PRINT S
400 REM***WAIT FOR KEY PRESS, 'SPACE' OR 'Q'
410 KEY$=INKEY$ : IF KEY$="" THEN 410
420 IF KEY$=" " THEN 510
430 IF KEY$="Q" THEN 110 ELSE 410
500 REM***COMPUTE NEXT NUMBER IN PATTERN
510 S=S+A
520 GOTO 310
900 REM***VALUES OF S AND A
910 DATA 1,1,  1,2,  2,2,  2,3
920 DATA 0,1,  0,2,  10,10,  3,5,  1E37,  1E37
```

In the above program, line 210 reads two numbers, the FIRST NUMBER (S) and the ADD-ON NUMBER (A). These numbers are read from the DATA statements in lines 910 and 920.

	S	A	S	A	S	A	. . .and so on
910 DATA	1,1,		1,2,		2,2,		2,3
	1st pattern		2nd pattern		3rd pattern		4th pattern
920 DATA	0,1,	0,2,	10,10,	3,5,	1E37,	1E37	
	5th pattern		6th pattern		7th pattern		8th pattern FLAGS

The DATA statements have values of S and A for eight (8) patterns, followed by two outrageous numbers, 1E37 and 1E37. These numbers are the *flags,* which say "There are no more numbers. We are *not* pattern numbers. We are here only to tell the computer that there are no more numbers."

Why two flags? Because, the READ statement (line 210) reads *two* values. There must be *two* values, or an OD (Out of Data) error message will occur when the TRS-80 tries to read *two* numbers in line 210. The second flag is not used, but must be there.

With the above program, you can plan your sequence of sequences, or pattern of patterns. You pick each FIRST NUMBER and you pick each ADD-ON number. You pick each *pair* of numbers in the DATA statements. Use as many pairs as you want, then finish with *two* flags, 1E37 and 1E37. If you change the flags, also change line 220 in the program. Please don't confuse the computer.□

To contact the author write Bob Albrecht, P.O. Box 310, Menlo Park, CA 94025.

The Pascal Notebook Chapter 7

By Henry Davis, Associate Editor

Since Pascal was designed with compiler writing in mind, it is not surprising that Pascal is good for compilers, assemblers and other systems programs. Because Pascal allows you to add special purpose functions and procedures, it can be used in virtually any programming task. However, due to the lack of certain intrinsic functions and data types, Pascal does not fit some applications well.

Examination of the data types and intrinsics and the missing pieces tells us what Pascal was not designed for. Binary Coded Decimal (BCD) is not provided as a basic data type. While it can be defined, the lack of BCD data and operations means that Pascal is not as efficient to program in as a business programming language like COBOL for business programming.

Likewise, the lack of mathematical functions indicates that Pascal is not well suited to scientific programming. All is not lost, however. Pascal can be used to implement special purpose languages for business, scientific or pedagogical languages like LISP or SNOBOL.

By now you no doubt are wondering how the stream of characters that makes up a Pascal program is converted into the tokens that the syntax analyzer operates on. The process of converting characters to meaningful symbols is termed lexical analysis because it deals with the lexicon or dictionary ordering of symbols.

Procedure INSYMBOL is the first major piece of code for the Pascal compiler. While the previous procedures may have dealt with unfamiliar algorithms, the code was relatively simple. INSYMBOL does not use a parameter list after the procedure name between the caller and callee. Instead global variables are employed to pass parameters. A global variable is one that can be accessed by any procedure in the program. Contrast this with a local variable which ceases to exist once the block defining it is exited.

Up until now we have avoided the use of labels and "gotos" in the previous procedures. For reasons of efficiency, the three labels are defined: 1, 2 and 3. Note that in Pascal, labels must be predefined at the beginning of the relevant block.

Additionally, the programmer is forced to actively participate in defining labels — GOTOs are not a bad programming technique by themselves but often times the total freedom associated with FORTRAN style. GOTOs encourage sloppy programming practices. The philosophy behind GOTOs in Pascal is one of programming freedom moderated by syntatic redundancy.

It is usually easier and more efficient to utilize the structured control structures instead of the unstructured GOTOs. The procedure INSYMBOL has three labels 1, 2 and 3 for exit conditions within the procedure. INSYMBOL is the interface point between you, the user, and the compiler. As such it must perform not only the conversion of strings of characters into symbols of Pascal, but it must also handle various error conditions such as illegal characters.

Following listing L4, the first action of the lexical analyzer is to "eat" spaces and blank lines through the end of line (EOL). Individual spaces are skipped by:

```
WHILE (CH= ' ') AND NOT EOL DO NEXTCH;
```

NEXTCH returns the next character in the source file.The REPEAT loop skips the EOL character but causes program flow to continue if the character is other than a space or end of line. At this point the character is either legal or illegal; the test for illegal characters is simplified by the use of sets.

The tedious initialization of the compiler makes testing of conditions and attributes easy. The array CHARTP contains information about the type of character (CH) used as a selector. Specifically, some characters are ILLEGAL. If a character is illegal then an appropriate error number (399) is emitted.

If a symbol begins with an alpha character, then it is an identifier of some type. Because there are special conditions for an identifier, a separate piece of INSYMBOL builds identifiers. Standard Pascal requires that each identifier be uniquely specified by the first eight characters. All subsequent characters are truncated. Because identifiers are terminated on the right by either a special or illegal character, building the ID continues until either the ID is terminated or more than eight characters are found.

Obviously, extraneous characters in an ID must be skipped. In the event less than eight characters are encountered, the remaining ID characters are set to blanks to facilitate searching and comparing. Note that every ID requires at least eight bytes regardless of its time size. There are techniques to handle variable sized IDs but they are considerably more complicated than that presented here.

Once the ID is built it is checked against the reserved symbols (RSY) to determine if it is one of the keywords of Pascal. If so the appropriate information is passed to the caller; otherwise it is identified as a user defined identifier.

If the first non-blank character INSYMBOL receives is a digit then what follows must be a number. Like identifiers, numbers have a maximum number of digits. Termination of a number is simpler than an identifier; a number ends when a non-numeric character is encountered. If a '.' or 'E' follows the number then the number is a real. Note that if a second '.' is encountered then there are two integers with the range symbol '..' between them.

Now the number is either an integer constant or a real constant. If the number was terminated by a '.' or 'E' then it is a real. When a number contains an 'E' then it is in scientific notation and has an exponent. Once the constant has been built a new structure is allocated with the NEW statement. It includes the constant, its class (real) and the global attributes. In case of error the value returned is zero.

Integers are a much simpler matter. First the size is checked and then the string is converted to an actual integer by the statement:

```
IVAL: =IVAL * 10 + ORDINT [DIGIT [K]]
```

Now the only conditions left for the scanner to handle are operators and other special symbols.

One more type of constant can occur in Pascal — a string constant. String constants are started and ended with single quote marks. Within Pascal a quote can be referenced by a series of four single quotes. Such a constant indicates the appropriate part of the CASE statement for handling string constants. The scanner builds the string constant until a closing quote or an end of line is encountered and then creates a new data structure with that constant.

The rest of INSYMBOL handles two-character symbols like: =, >= and single-character operators. A special kind of two-character symbol indicates that a comment has been encountered or terminated. The comment symbols are special because they direct the compiler to ignore all characters in between since they are for the programmer's use only.

Throughout this discussion of the scanner INSYMBOL, constant reference has been made to a procedure called NEXTCH whose sole apparent purpose is to return to the next character. Actually NEXTCH does read the next character via the standard procedure READ but it also prints a listing if so desired. In addition, certain error conditions like end of file (EOF) which is a fatal error are detected. Note that an end of line is never a true error condition at this level; the outer program must simply determine if an EOL did occur.

Another procedure which was assumed to exist is ERROR. Try following this code through to determine its function. Hint: how many errors can occur in one statement and where are these error messages printed?

Procedure OPTIONS determines which compiler options have been selected. For the most part this routine simply sets up global variables to indicate the options. However, one statement is interesting by itself:

```
PRTABLE: =CH = '+'
```

Remember that in Pascal the equal sign by itself is a comparison with a Boolean result. So the statement means that CH is compared to '+' and the result of the test is stored in PRTABLE. This allows you more programming freedom than is generally available in most programming languages.□

Program Follows

Persons interested in receiving Listings 1, 2 and 3 should send a large self-addressed envelope to Pascal Notebook, INTERFACE AGE Magazine, P.O. Box 1234, Cerritos, CA 90701. Henry Davis can be contacted at American Microsystems, Inc., 3800 Homestead Rd., Santa Clara, CA 95051.

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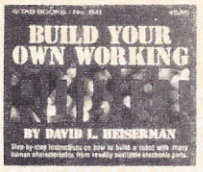

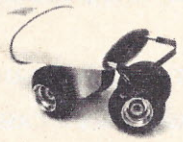

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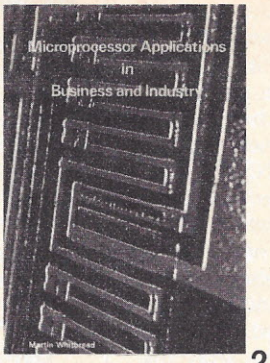

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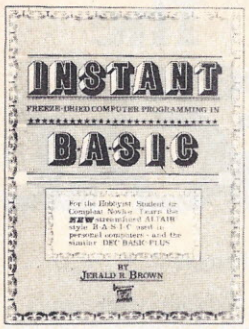

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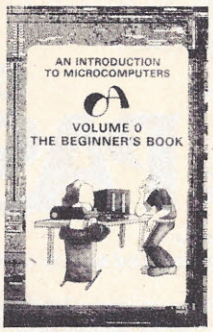

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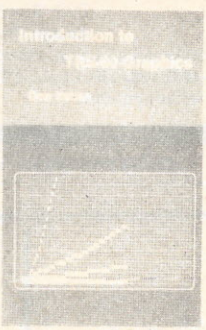

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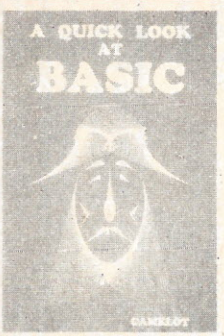

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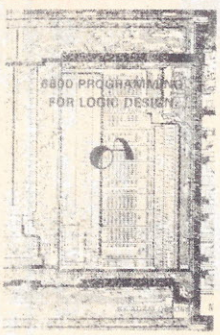

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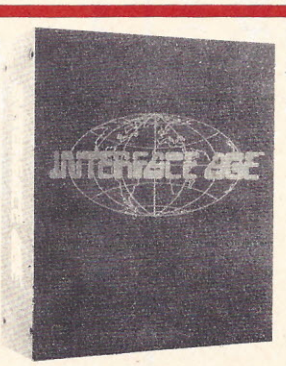

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PROGRAM LISTING 4

```
PROCEDURE INSYMBOL;
  (*READ NEXT BASIC SYMBOL OF SOURCE PROGRAM AND RETURN ITS
  DESCRIPTION IN THE GLOAL VARIABLES SY, OP, ID, VAL AND LGTH*)
  LABEL 1,2,3;
  VAR I,K:  INTEGER;
      DIGIT: PACKED ARRAY [1..STRGLGTH] OF CHAR;
      STRING: PACKED ARRAY [1..STRGLGTH] OF CHAR;
      LVP: CSP;TEST:  BOOLEAN;

BEGIN (*INSYMBOL*)
1:
  REPEAT WHILE (CH = ' ') AND NOT EOL DO NEXTCH;
    TEST := OL;
    IF TEST THEN NEXTCH
  UNTIL NOT TEST;
  IF CHARIP[CH]  = ILLEGAL THEN
    BEGIN SY  := OTHERS; OP  := NOOP;
      ERROR(399); NEXTCH
    END
  ELSE
  CASE CH OF
    'A','B','C','D','E','F','G','H','I',
    'J','K','L','M','N','O','P','Q','R',
    'S','T','U','V','W','X','Y','Z':
      BEGIN K  := 0;
        REPEAT
          IF K < THEN
           BEGIN K  := K + 1; ID[K]  := CH END ;
          NEXTCH
         UNTIL CHARTP[CH] IN [SPECIAL,ILLEGAL];
        IF K >= KK THEN KK  := K
        ELSE
          REPEAT ID [KK]  := ' '; KK  := KK - 1
          UNTIL KK = K;
        FOR I  := FRW[K] TO FRW[K+1] - 1 DO
          IF RW[I] = ID THEN
            BEGIN SY  := RSY[I]; OP  := ROP[I]; GOTO 2 END;
          SY  := IDENT; OP  := NOOP;
2:    END;


 '0','1','2','3','4','5','6','7','8','9':
   BEGIN OP := NOOP; I := 0;
     REPEAT I := I+1; IF I<= DIGMAX THEN DIGIT[I] := CH; NEXTCH
     UNTIL CHARTP[CH]<> NUMBER;
     IF (CH ='.') OR (CH = 'E') THEN
       BEGIN
             K :=I;
             IF CH = '.' THEN
               BEGIN K := K+1; IF K <= DIGMAX THEN DIGIT[K] := CH;
     LGTH := LGTH - 1;    (*NOW LGTH = NR OF CHARS IN STRING*)
     IF LGTH = 1 THEN VAL.IVAL := ORD(STRING[1])
     ELSE
       BEGIN NEW(LVP,STRG); LVP@.CCLASS:=STRG;
         IF LGTH > STRGLGTH THEN
           BEGIN ERROR(399); LGTH := STRGLGTH END;
         WITH LVP@ DO
           BEGIN SLGTH := LGTH;
             FOR I := 1 TO LGTH DO SVAL[I] := STRING[I]
           END;
         VAL.VALP := LVP
       END
   END;
 ':':
   BEGIN OP := NOOP; NEXTCH;
     IF CH = '=' THEN
       BEGIN SY := BECOMES; NEXTCH END
     ELSE SY := COLON
   END;
 '.':
   BEGIN OP := NOOP; NEXTCH;
     IF CH = '.' THEN
       BEGIN SY := COLON; NEXTCH END
     ELSE SY := PERIOD
   END;
 '<':
   BEGIN NEXTCH; SY := RELOP;
     IF CH = '=' THEN
       BEGIN OP := LEOP; NEXTCH END
     ELSE
       IF CH = '<' THEN
         BEGIN OP := NEOP; NEXTCH END
       ELSE OP := LTOP
   END;
 '>':
   BEGIN NEXTCH; SY := RELOP;
     IF CH = '=' THEN
       BEGIN OP := GEOP; NEXTCH END
     ELSE OP := GTOP
   END;
 '(':
   BEGIN NEXTCH;
     IF CH = '*' THEN
       BEGIN NEXTCH;
         IF CH = '$' THEN OPTIONS;
         REPEAT
           WHILE CH <> '*'  DO NEXTCH;
           NEXTCH
         UNTIL CH = ')';
         NEXTCH; GOTO 1
       END;
    SY := LPARENT; OP := NOOP
  END;
 '*','+','-',
 '=',',','/',')',
 '[',']',',',';','@','$':
```

```
              NEXTCH; IF CH = '.' THEN BEGIN CH := ':'; GOTO 3 END;
              IF CHARTP[CH]<> NUMBER THEN ERROR(201)
              ELSE
                REPEAT K := K + 1;
                  IF K <= DIGMAX THEN DIGIT[K] := CH; NEXTCH
                UNTIL CHARTP[CH] <> NUMBER
            END;
          IF CH = 'E' THEN
            BEGIN K := K+1; IF K<= DIGMAX THEN DIGIT [K] := CH;
              NEXTCH;
              IF (CH = '+') OR (CH ='-') THEN
                BEGIN K := K+1; IF K <= DIGMAX THEN DIGIT[K] := CH;
                  NEXTCH
                END;
              IF CHARTP[CH] <> NUMBER THEN ERROR(201)
              ELSE
                REPEAT K := K+1;
                  IF K <= DIGMAX THEN DIGIT[K] := CH; NEXTCH
                UNTIL CHARTP[CH] <> NUMBER
              END;
            NEW(LVP,REEL); SY:= REALCONST; LVP@.CCLASS := REEL;
            WITH LVP@ DO
              BEGIN FOR I := 1 TO STRGLGTH DO RVAL[I] := ' ';
                IF K <= DIGMAX THEN
                  FOR I := 2 TO K + 1 DO RVAL[I] := DIGIT[I-1]
                ELSE BEGIN ERROR(203); RVAL[2] := '0';
                       RVAL[3] := '.'; RVAL[4] := '0'
                     END
              END;
            VAL.VALP := LVP
      END
    ELSE
3:    BEGIN
        IF I > DIGMAX THEN BEGIN ERROR(203; VAL.IVAL := 0 END
        ELSE
          WITH VAL DO
            BEGIN IVAL := 0;
              FOR K := 1 TO I DO
                BEGIN
                  IF IVAL <= MXINT10 THEN
                    IVAL := IVAL*10+ORDINT[DIGIT[K]]
                  ELSE BEGIN ERROR(203); IVAL := 0 END
                END;
              SY := INTCONST
            END
        END

  END;
''''';
  BEGIN LGTH := 0; SY := STRINGCONST; OP := NOOP;
    REPEAT
      REPEAT NEXTCH; LGTH := LGTH + 1;
             IF LGTH <= STRGLGTH THEN STRING[LGTH] := CH
      UNTIL (EOL) OR (CH = '''');
      IF EOL THEN ERROR(202) ELSE NEXTCH
    UNTIL CH <> '''';
```

```
      BEGIN SY := SSY[CH]; OP := SOP[CH];
        NEXTCH
        END;
    ' '; SY := OTHERSY
  END (*CASE*)
END (*INSYMBOL*) ;

PROCEDURE NEXTCH;
BEGIN IF EOL THEN
  BEGIN IF LIST THEN WRITELN(OUTPUT); ENDOFLINE

  END;
  IF NOT EOF(INUT) THEN
   BEGIN EOL := EONL(INPUT); READ(INPUT,CH);
    IF LIST THEN WRITE(OUTPUT,CH);
    CHCNT  := CHCNT +1
   END
  ELSE
    BEGIN WRITELN(OUTPUT,'    *** EOF ','ENCOUNTERED');
      TEST := FALSE
    END
END;

PROCEDURE ERROR(FRRNR: INTEGER);
BEGIN
  IF ERRINX >= 9 THEN
    BEGIN ERRLIST[10].NMR := 255; ERRINX := 10 END
  ELSE
    BEGIN ERRINX := ERRINX + 1;
      ERRLIST[ERRINX].NMR := FERRNR
    END;
  ERRLIST[ERRINX].POS := CHCNT
END (*ERROR*) ;
PROCEDURE OPTIONS;
BEGIN
  REPEAT NEXTCH;
    IF CH <> '*' THEN
      BEGIN
        IF CH = 'T' THEN
          BEGIN NEXTCH; PRTABLES := CH = '+' END
        ELSE
          IF CH = 'L' THEN
            BEGIN NEXTCH; LIST := CH = '+';
              IF NOT LIST THEN WRITELN(OUTPUT)
            END
          ELSE
          IF CH = 'D' THEN
            BEGIN NEXTCH; DEBUG := CH = '+' END
          ELSE
            IF CH = 'C' THEN
              BEGIN NEXTCH; PRCODE := CH = '+' END;
          NEXTCH
        END
    UNTIL CH <> ','
  END (*OPTIONS*) ;
```

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S1069

Using and Building Micro-Based Systems

Chapter One

By David Marca, Associate Editor

Now that microcomputers are affordable by small businesses, there is a great trend to use the computer as much as possible in the day-to-day running of the business. However, a closer look at the way small businesses are getting into the microcomputer boom has exposed an interesting phenomenon. The pains of becoming and staying computerized for small businesses are similar to the pains of large organizations when they started twenty years ago.

Why? These same pains experienced are being caused by symptoms that are fundamentally the same, but have taken on slightly different appearances:

1. When computers first became commercially available, large companies thought they could see the benefits of using them in their organizations. Today, microcomputers are affordable, so small businessmen think they can foresee those same kinds of benefits on a smaller scale. Symptom: Purchasing a computer before really understanding how it will be used to benefit an organization.
2. Originally, programs were developed with great consideration for computer resources and little consideration for the people using the computer. Today, home-grown programs are built and software packages are bought with little regard to the long-term impact on the small business organization. Symptom: Producing or buying a working program does not imply the program will work well with the people and procedures of an organization.
3. Originally, as large organizations changed, computer systems could not easily adapt to meet new requirements. Today small businesses are finding it difficult to modify previously bought packages or home-grown programs when an aspect of their business changes. Symptom: Programs built to meet immediate needs may not be usable in the future due to change.

Even though the *forms* of the symptoms are different, the pains experienced are still the same because the same disease is present. We are led to believe that since *computers* are affordable, *programs* can be developed which will work smoothly with an organization. We are focusing our attention upon the new hardware and the new fad of programming, and are not paying any attention to the real issue — people, computers, and programs must *work well together* and must be able to *change together.*

The major purpose of this tutorial, therefore, is to describe the major principles of using and building working micro-based *systems.* Much of the tutorial will investigate specific features and problems when using the FORTRAN programming language to build software. By the end of the tutorial: 1) users should be able to understand what is required to build a working system, 2) developers should be able to understand what users must specify in order to build a working system, and 3) both should understand how to interact with each other. It has been said:

> "A technological society must be in a continuous state of change. Yet what people want most from society is stability."[1]

Hopefully by the end of this tutorial, we can have a better idea of how to deal with continual change, and be stable enough to effectively use the technology of microcomputers to improve the way we do business.

TUTORIAL OUTLINE

The series of articles is clustered into six groups of two articles each. The first two provide a context for the remainder of the series, and discuss fundamental concepts of system development.

Some basic FORTRAN concepts are presented in the second group of articles, and common programming problems are implemented with the language in the third article group. The next two groups of articles look at the "front-end" and "back-end" of application programs, discussing concepts of user interfaces and databases.

Lastly, the major issues of installing and using a system are presented. Major topics in order of presentation are as follows:

I. System Development Principles and Techniques
II. Rudiments of FORTRAN
III. Applying FORTRAN
IV. User Interface Concepts
V. Data Storage and Retrieval Concepts
VI. Systems in Operation

Remember that all programming examples will be written in FORTRAN, and will be *working* programs. Whenever a program development tool is used to produce those FORTRAN examples, a description of the development program or procedure will be given. If the going gets tough, and you are still unsure of a concept after careful study, you can contact me — my phone number and address are at the end of each section.

SYSTEM LIFE CYCLE

We are constantly surrounded by systems every day. The car we drive is a system. The world we live in is a system. Even our bodies are systems. Just by living, we participate (sometimes knowingly, sometimes not) in a myriad of systems.

With the advent of computer technology, many more of us are not only participating in systems, but are also taking an active role in the building of systems for others to use. As a result, more participants (users) are interacting with builders (developers) to produce systems that are more complex and (hopefully) easier to use. A better understanding of user and developer roles will improve the quality of systems produced.

The concept of System Life Cycle is a vital aid towards gaining that understanding. We will therefore investigate the System Life Cycle and employ it to define user and developer roles in the specific area of micro-based computer systems. Before we discuss System Life Cycle, however, we should all have a firm definition of what exactly is a system.

A DEFINITION OF "SYSTEM"

As discussed earlier, people have a general understanding of the word "system." In fact, Webster gives several good definitions, one of which is: *A complex unity formed of many often diverse parts subject to a common plan or serving a common purpose.*

So a system is actually a group of parts working together and ultimately achieving some predefined goal. This definition is certainly sufficient as a definition of the system as a whole.

But there is more to system than just the whole. Another definition focuses upon the components that make up a system: *"A system is a set of objects together with relationships between the objects and between their attributes."*[2]

Ah! So the system's parts actually have features which distinguish one part from another. Also, each part has specific relationships with other parts of the system. These theoretical definitions give an understanding of a system in general. However, one additional view may shed some light on the practical aspects of system: *A correct system is one in which the right sets of actions are executed on the right sets of data at the right times.* [3]

While this is a more restrictive definition than the first two, it is appropriate because *correct* systems are extremely important. We rely upon systems *working correctly* for our existence, growth and happiness.

Working systems usually have one very important feature which is often overlooked — they are living. They evolve over time, and change to meet the challenges of the environment around them. Thus the definition of a system that will be used for this tutorial is summarized by the following:

A *system*

1. Is a working whole.
2. Contains parts having distinguishing qualities and relationships to one another.
3. Does the right things at the right times.
4. Changes over time.

The final point of a system being capable of evolution introduces the concept of System Life Cycle.

TOWARDS AN UNDERSTANDING OF SYSTEM LIFE CYCLE

Confusion can occur when a program is viewed as a system, if it is thought that it will be built only once. Programs are indeed built, used, and eventually thrown away. Yet what gets thrown away is really only a *part* of the *real* system. The system (people, procedures, and even the data!) continues to exist, while the program does not.

A good understanding of this process of continuous change can be achieved by remembering two analogies. First, remember that System Life Cycle is like the spectrum of white light. Just as the spectrum of white light has three primary colors (red, yellow and blue), the System Life Cycle has three basic phases: Analysis, Design, and Implementation (see Figure 1).

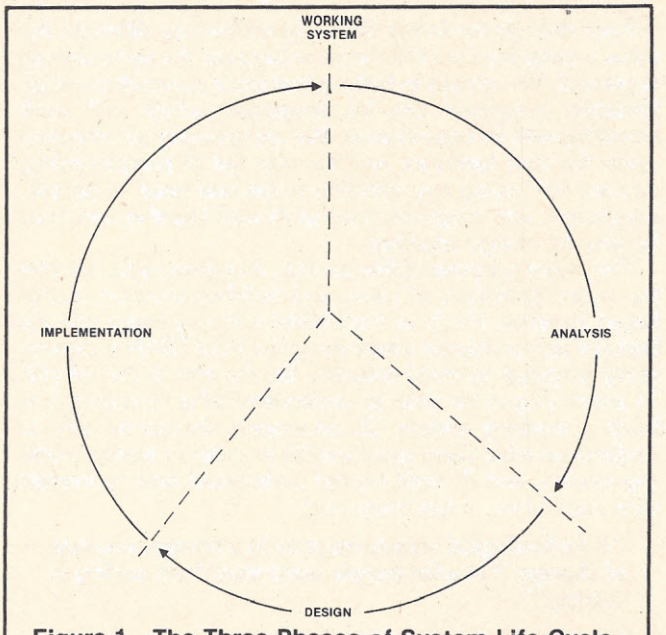

Figure 1. The Three Phases of System Life Cycle

MANAGE

NATURAL LANGUAGE DATA BASE MANAGER
FOR THE ALPHA MICRO SYSTEM

Allows processing of files by sentences written in English, rather than by programs written in a computer language. For example, you may ask the computer to "List prospects whose interest is houses and whose price is between $60,000 and $90,000 by Zip Code as labels".

Definitional capability allows easy categorization of records into terms meaningful to the user. For example, telling the computer "DEF: Pasadena Residents: Mailing whose Zip Code is between 91101 and 91108 but not 91102" would allow subsequent processing using only the words "Pasadena Residents" to refer to that group. User defined terms are unlimited in form, length and number.

Help messages are available throughout the system for user convenience. By simply entering a question mark, at any time, the system will respond with a message specifying the type of input MANAGE is expecting. Dual question marks will print the message in greater detail. Triple question marks will display a complete, menu driven user's manual.

Other special features include: user defined, unlimited length fields; access from user programs via command files; passwords; background processing; and flexible output formatting.

A new approach to memory management optimizes the mapping of data, and the loading of programs, for maximum operating speed in the amount of memory available in the user's system. This is done automatically, and is transparent to the user. Thus thousands of records can be stored, ordered, categorized and otherwise processed in a matter of seconds, rather than in minutes or hours. Practical applications include:

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Personnel files	Reservation system
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Similarly, just as the three primary colors are not distinct (i.e. there is a mix of colors between any two primary colors — like green or orange), the three basic phases of System Life Cycle are not distinct. There is no real sharp distinction between System Life Cycle phases because some system development activities have properties of more than one basic phase.

The second analogy worth remembering is that System Life Cycle is like a corkscrew. As we start with a working system, go through the system development phases, and end up with a *new* system, remember that the new system is different than the old system in many ways. Hence, if we observe a system evolving over time, it will have gone through many System Life Cycles (see Figure 2).

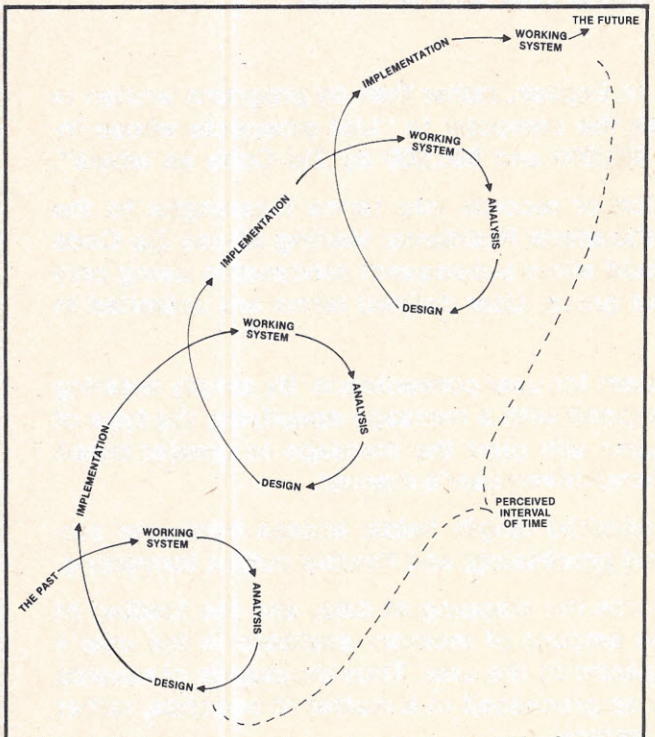

Figure 2. A Generic View of a System's Life Cycles

Even though we have the best understanding of System Life Cycle today, we will acquire more knowledge as time goes on, and hence improve upon our fundamental definitions. Let's now take this fundamental understanding and use it to define user and developer roles during the building of a system.

A USER'S VIEW OF SYSTEM LIFE CYCLE

Users must constantly keep in mind that developers are *solving their problems.* A simple definition of problem solving from a user point of view will help to identify the user's role in the analysis phase of System Life Cycle:

A problem *is*

1. *a state of* affairs
2. *a set of* requirements
3. *a set of criteria for evaluating the states of affairs with respect to the requirements such that the state of affairs is* unsatisfactory.

A solution *to that problem is the same, except that the state of affairs is* satisfactory. [4]

Thus, during the analysis phase, users must specify: 1) why the new system is needed, 2) what the new system must do, and 3) how the new system will be approved or accepted (see Figure 3). These specifications should be recorded and organized into an analysis document by the developers, and the users should review and approve this document before the design phase starts.

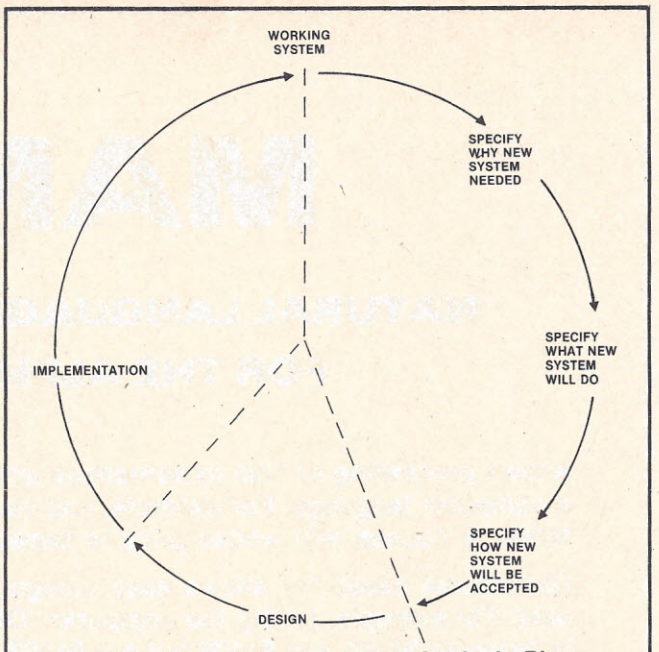

Figure 3. User Activities in the Analysis Phase

Once design starts, the primary role users will play is during the specification of details (i.e. timing and formats of reports and data) that are critical to the system's *external* appearances. Since the design phase is a time of constant decision making given a host of conflicting requirements, two other important user activities occur. First, users may be required to select from a number of solution alternatives for a specific design problem.

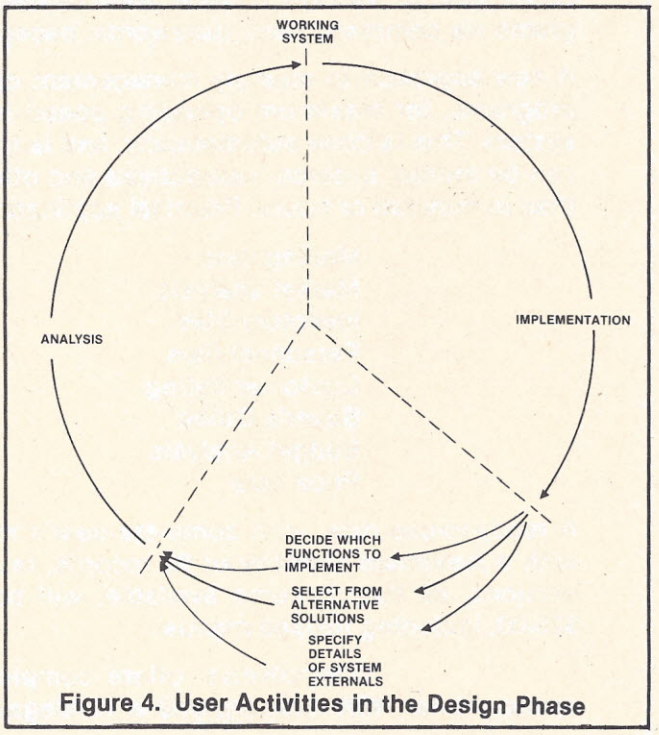

Figure 4. User Activities in the Design Phase

Secondly, users may need to postpone or eliminate the implementation of certain functions of the new system. All the user activities in the design phase generally occur without pattern or sequence, as shown in Figure 4.

During implementation, the user's activities occur in a much more sequential pattern (see Figure 5). After the system has been built, a process of system acceptance should be performed, and when acceptable, the new system is then installed.

The installation can be as easy as running a new program, or as difficult as building a physical structure to house new

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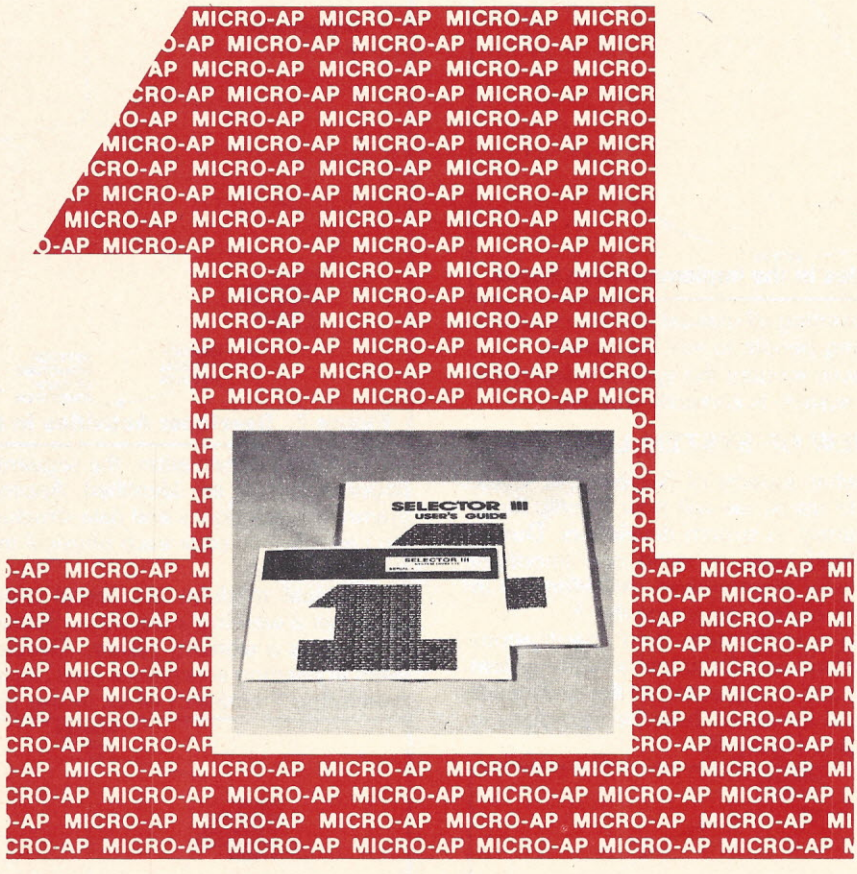

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- select collections of records meeting your exact requirements and arranged in the order wanted.
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SELECTOR III-C2 is a 'turn-key' system that can manage most applications as is. It includes source-code and pre-defined record formats and sub-programs to perform the tasks listed at top of page. Programmers can easily add other sub-programs - using the system's powerful utilities - to perform virtually any special computation or function required.

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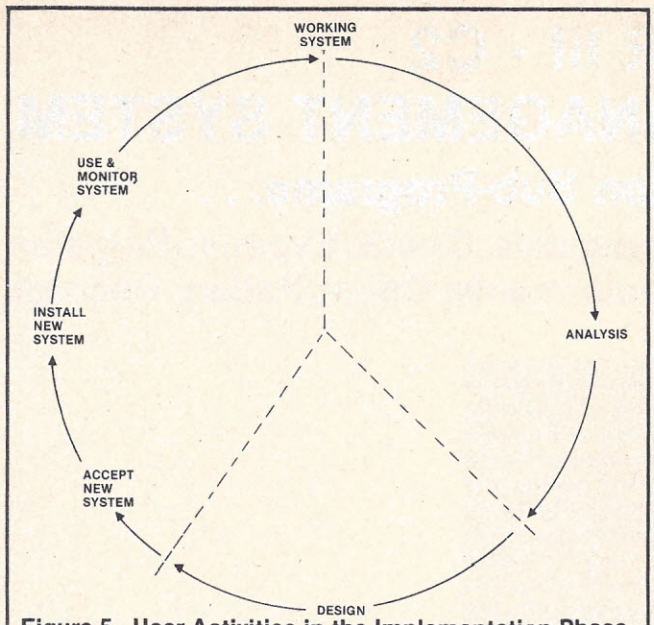

Figure 5. User Activities in the Implementation Phase

computer hardware, converting all manual files into machine readable form and training people to run the system.

Lastly, users must heavily monitor the system's day-to-day operation to ensure the system is *correctly* working.

A DEVELOPER'S VIEW OF SYSTEM LIFE CYCLE

Having investigated what aspects of System Life Cycle activities are important to users, we will now identify those activities which are important to system developers. During analysis, developers should keep in mind one important point: *The key to successful requirements definition lies in remembering that people define requirements.* [5]

So developer activities actually stem from specifications given by users: 1) understand and document why the system is needed, 2) understand and document what the system will do, and 3) understand and document how the user plans to accept the new system (see Figure 6).

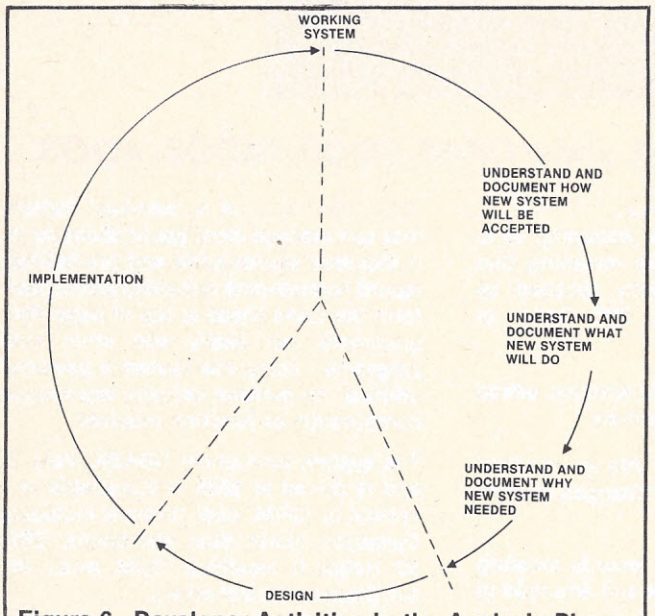

Figure 6. Developer Activities in the Analysis Phase

Understandings of current operations, current environment, future system functions, and system data are all documented during analysis. Once a thorough understanding of what will be done is achieved, the design phase is then started.

The activities of developers in design are many and varied, but they are performed in a fairly sequential manner. First, the developer must divide the system into subsystems according to the application functions and data. Next, the overall structure of each subsystem is defined. The structure of each subsystem is then used to identify physical program modules. Finally, the sequential properties of the system are defined and the sequential execution of physical modules is verified (see Figure 7).

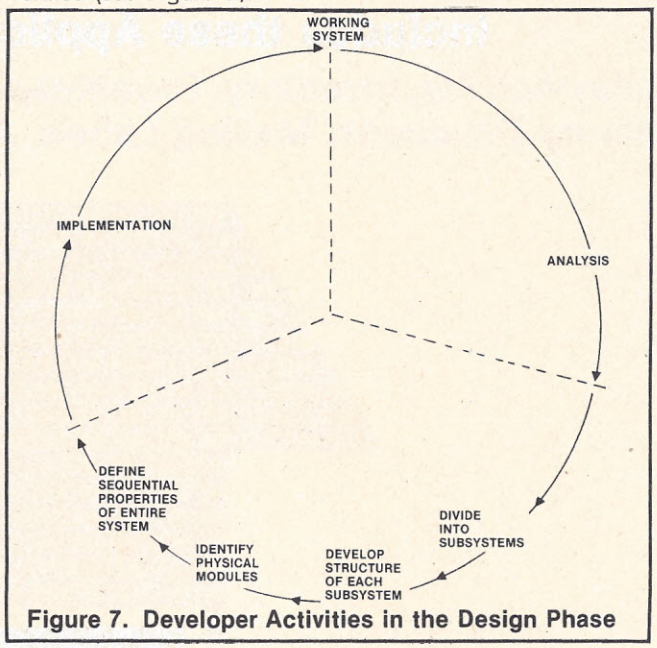

Figure 7. Developer Activities in the Design Phase

During implementation, the sequential properties of each physical module are identified. Appropriate structured programming techniques and data structures (i.e. arrays, tables, etc.) are used to code each physical module into a machine readable form.

Individual modules are tested separately, and then together as a working subsystem. Subsystems are then tested together as a working system. Developers may then assist users in running acceptance tests, installing the system, and monitoring the system when in use (see Figure 8).

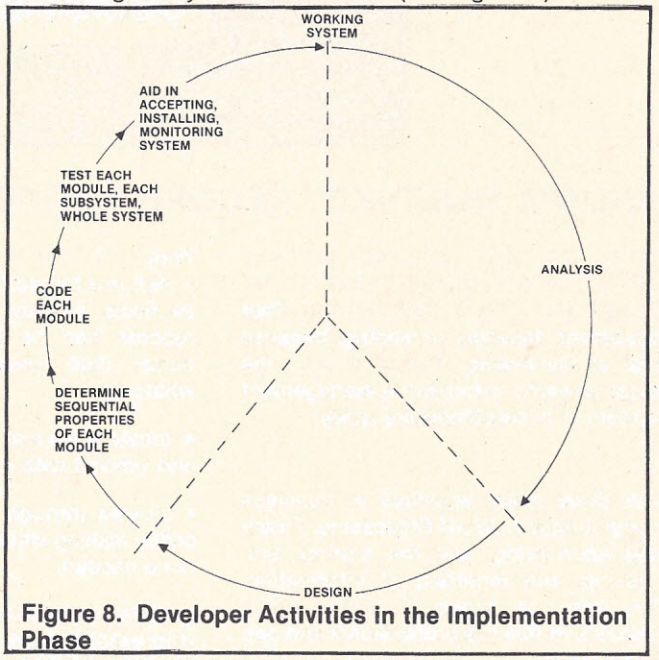

Figure 8. Developer Activities in the Implementation Phase

INTERACTIONS BETWEEN USERS AND DEVELOPERS

Using the two separate views of System Life Cycle, interactions between users and developers can now be described. A look at Figures 3 and 6 reveals that interactions between users and developers in the analysis phase are very simple. Users tell developers *what* they want done. Developers document their understanding of user specifications, and review

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their work with the user community. This process of documenting and reviewing is repeated until the users approve the written specifications of what the system must do.

This process of repeated review (until approval) occurs in the design phase, too. Written specifications of critical details (i.e. timing and format of reports and data) are approved in this way. However, the most important items approved in design are the resolution of issues. An issue arises when developers (while they are representing a solution the user's problem) can solve a particular aspect of the problem in one of several different ways.

The impact of each alternative solution is assessed, and one is finally selected. The entire process of documenting: 1) the issue and alternative solutions, 2) the selection of the desired alternative, and 3) user confirmation of the selection is performed by the developers.

The processes of repeated review until approval and issue resolution do not occur heavily in the implementation phase. Some minor issues usually need resolving, but major solutions have been spelled out by this time, and hence need very little attention by either users or developers.

Once the new system has been coded and has passed all development tests, users and developers again work closely together. The last sessions of review until approved are carried out during acceptance testing, with some issues being raised and resolved at this time. Once the system has passed the acceptance tests, users and developers work together to install the system and monitor its usage according to the project plan.

Even though we can understand what is expected of both users and developers during the System Life Cycle, we can avoid conflicts by taking note of a very important rule: *(developers) don't take their (users') solution method for a problem definition.* [6]

In other words, the users must not tell developers how they think their problem should be solved. It is always better for users to state their problem, let developers come up with some alternatives for the problem solution, and then (and only then) make a decision about how to properly solve the problem. Keeping this in mind will definitely reduce the potential of possible conflicts between users and developers, and will lead to a correct solution to the user's real problem.

CONCLUSION

The basic concepts of System Life Cycle have been discussed, as well as user and developer roles during an entire project. The second article will define what comprises a system development methodology, including examples from the best methods in industry today. Once we have these definitions under our belt, the tutorials on FORTRAN and programming can be put into context, and will hopefully be easy to understand.□

REFERENCES

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The author thanks Softech, Inc., Medicomp Systems, Inc. and Microsoft, Inc. for their help in the preparation of this series. *David A. Marca can be contacted at 30 Evergreen Avenue, Wellesley, MA 02181, (617) 237-7292.*

THE BUGBOOK VIII: 8080/8085 SOFTWARE DESIGN WITH 190 SOFTWARE SOLUTIONS

By Christopher A. Titus, Peter R. Rony, David Larsen and Jonathan A. Titus
E & L Instruments. 310 pages

Review by Jack Kirschenbaum

The major goal of this book is to provide the reader with a thorough instruction to the assembly language instruction set and programming of the Intel 8080 and 8085 microprocessors.

All of the authors are eminently qualified to meet this goal. Their collective intelligence and experience is evident throughout the book. To achieve their goal the authors have incorporated a number of very effective instructional procedures and write in a precise, logical and easy to understand style.

The first chapter introduces the register organization and functions of the 8080/85. Chapters 2 and 3 introduce the basic instruction set of the chip which covers from 60 to 90 percent of all programming tasks. This includes data movement to and from registers and memory, input and output, mathematical and logical instructions, jumps and subroutine calls.

Chapter 4 covers all the advanced instructions of the chip that makes the 8080/85 instructional set so powerful and flexible such as register pair operations, stack pointer and program counter manipulations. Chapter 5 covers mathematical routines, Chapter 6 covers number base conversions and Chapter 7 deals with advanced input output routines.

A common format is used for each group of instructions covered. The purpose of the instruction is discussed and program examples of its uses are given. Every program example is thoroughly described and explained. The programs presented have a practical focus and train the reader to solve typical programming problems as well as illustrate a variety of programming strategies.

I found the authors frequent contrasting and comparing of instructions helpful in clarifying the uses and limitations of each instruction and fixing them clearly in my mind. The authors repeat main ideas and instruction operations several times, using fresh new words and new examples. If you didn't understand or remember them the first time, you will by the last repetition.

I particularly appreciate the authors' discussions and examples of how the hardware and software interrelate in I/O operations.

I tried many of the programming examples in each chapter on my Vector Graphic Z-80 computer as I traced their logic flow and studied the authors detailed explanation. After studying this book I can read and understand most of the assembly language coding and logic of my computer's operating system and have successfully written customized I/O routines.

A major shortcoming was a complete absence of common assembler language instructions such as labeling, pseudo operations, equats, etc. The book confines itself to the standard Intel instruction set. The book has no index or summary table for the total instruction set.

Bugbook VIII is a worthy addition to the popular Bugbook series. If you are new to assembly language programming, I can't think of a better book than Bugbook VIII to start studying. If you have had limited experience, then this book will give you the depth of knowledge you may be seeking. Advanced programmers will find the 190 programs presented a small library of useful routines to add to their resources.□

LASERS, THE LIGHT FANTASTIC

By Clayton L. Hallmark
Tab Books. 294 pages, $6.95

Review by Carl V. Olsen

In learning something new, one must always start from the beginning. This book does a good job of doing just that. Hallmark starts with the ground work. He gives the reader an understanding of the basic principles, then he goes into applications.

After the basics, Hallmark goes into the makings of resonant cavities and wave guides for microwaves. He gives the details as far as the overall dimensions of resonant cavities. He also discusses the effects that the different shapes have on the different cavities.

In describing the lasers, Hallmark tells of the ruby laser, gas lasers, and semiconductor lasers. All are described in good detail and the basic structures are included. Hallmark also describes the way a laser gets its coherent color.

The author tells how a laser is used in communication and illustrates how they modulate the laser so it can carry the messages. He completes the picture by telling how demodulation is done.

Hallmark also describes the way that lasers can be used for radar and ranging. He shows how NASA is using laser ranging in its exploration of the movement of the earth along the San Andreas fault in California. Hallmark also explains how the laser can be used as a gyroscope in space.

The author sets out to give an introduction to lasers. He does a very good job to achieve his point.□

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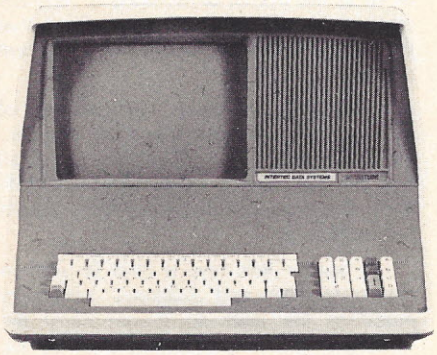

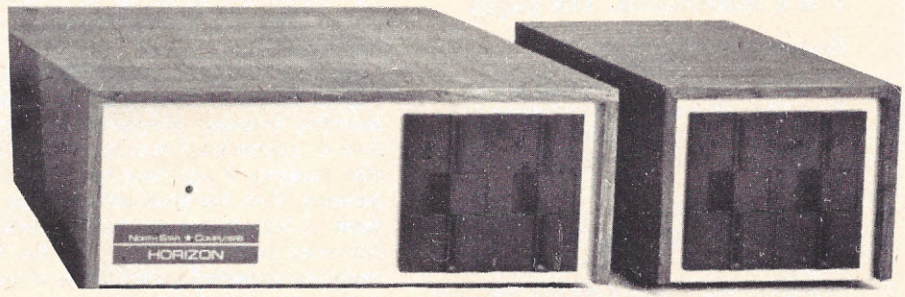

The NORTH STAR HORIZON® is a price-performance leader in S-100 systems. It features a 4 MHz CPU board and double-density disk controller board. All Horizons* now come with two serial RS232C ports, a parallel port, all 12 edge connectors, and an interface cable for connection to an external drive. Horizons are available as single-drive units (Horizon 1) or dual-drive units (Horizon 2). Drives can be double density or double-sided (quad density). A Horizon 2 with two external quad drives gives the user 1.4 megabytes of on-line storage. The Horizon comes with a DOS and North Star Extended Disk BASIC. A CP/M operating system is only $129.

Just add a terminal and you have a complete and extremely flexible computer system. For example, either the INTERTUBE II or Perkin-Elmer BANTAM 550 video terminals are only $799 additional from MiniMicroMart.

** A few 16K Horizons still available as low as $1349!*

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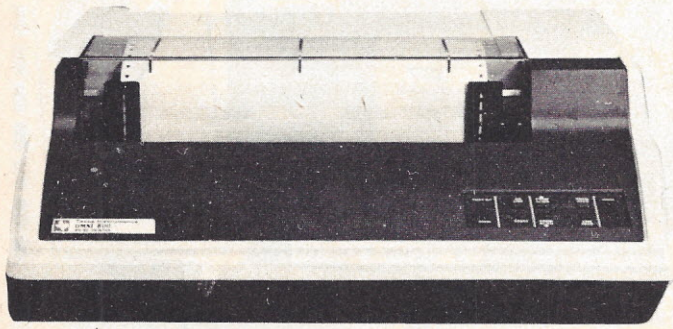

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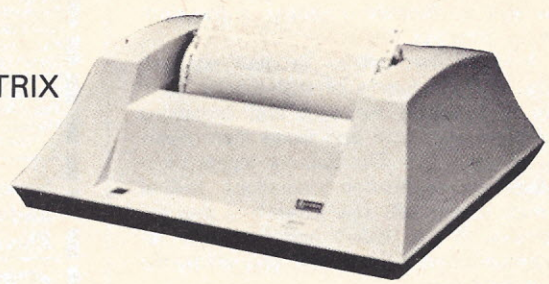

NOTE: Horizons may be ordered for future delivery with only 10% deposit.
SHIPPING, HANDLING and INSURANCE: Add $15 for Horizons, $10 for terminals or Anadex printer. T.I. printer shipped freight collect.
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NEW PRODUCTS

Light Pen and Pick-Module

Megatek Corporation has available a light pen and pick-module for use with its recently-introduced Whizzard 7000 series of vector refresh graphic terminals and systems. The light pen and pick-module feature automatic highlighting to provide the user with real-time feedback while working at the Whizzard display.

The light pen's highlighting feature causes any vector or character to blink when the user points to that item on the screen with the light pen.

The pick-module is essentially a digital light pen which can be tied to joystick or digitizer inputs.

Contact Megatek Corp., 3931 Sorrento Valley Blvd., San Diego, CA 92121, (714) 455-5590.

CIRCLE INQUIRY NO. 121

Rigid Disk Drive Subsystem

Micropolis Corporation has introduced an 8-inch rigid disk drive subsystem that includes a multi-terminal operating system.

Designed primarily for the small business system builder and end-user add-on markets, the MicroDisk™ subsystem includes a three-platter drive with up to 31.2 million bytes of formatted storage capacity, an intelligent disk adapter-interface card, power supply, and a modularized software package (OSM).

OSM interfaces to the S-100 bus and is fully supported for immediate plug-in use on 8080, 8085 and Z-80 microcomputer systems.

For more information contact Micropolis Corp., 7959 Deering Ave., Canoga Park, CA 91304.

CIRCLE INQUIRY NO. 122

S-100 Plug-In Imaging Unit

A video imaging and graphics system with real-time TV frame grabber which plugs into the S-100 bus is available from Digital Video Systems.

The CAT-100 is a compact two-board color video imaging system. It offers three fundamental functions: a video frame digitizer, an image memory, and an output video generator.

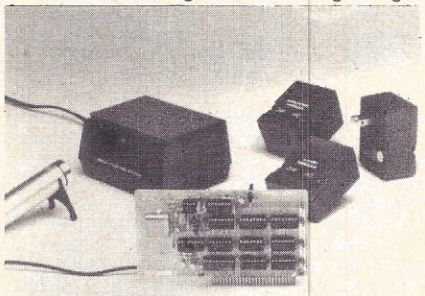
The digitizer can capture a video frame in 1/60th of a second and store it in the on-board 32K byte image memory. The video generator displays the digitized image in 16 shades of gray or 16 colors on standard black & white or color TV monitors. It can also drive a high-resolution RGB monitor.

For more information contact Digital Video Systems, 595 Matadero Ave., Palo Alto, CA 94306, (415) 494-6088, J. Robert Flexer.

CIRCLE INQUIRY NO. 123

Remote Controller

Introl/X-10 allows uers to remotely control 110 volt AC devices by commands sent over existing building wiring. Utilizing the intelligence of the Apple computer, command signals are sent to a BSR/System X-10 Command Console which then sends signals over existing wiring.



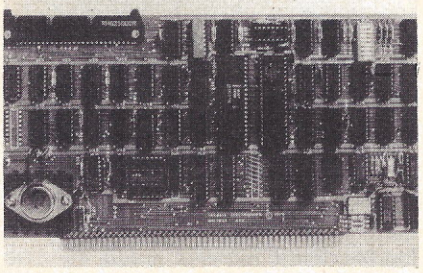
The Introl Controller board plugs into a peripheral slot of the Apple. Introl/X-10 comes with software to control devices on predetermined schedules.

For details contact Mountain Hardware, Inc., 300 Harvey West Blvd., Santa Cruz, CA 95060.

CIRCLE INQUIRY NO. 124

Double Density Floppy

Tarbell Electronics has a Double Density Floppy Disk Interface which enhances existing disk storage capacities with minimum reconfiguration of existing microcomputer systems.



The board is supplied with the BASIC Input/Output System software for CP/M on single-density diskette to permit intermixing of single and double density diskettes.

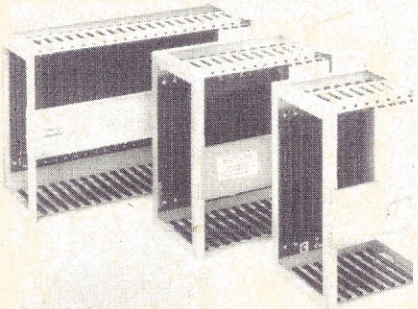
Contact Tarbell Electronics, 950 Dovlen Pl., Suite B, Carson, CA 90746, (213) 538-4251.

CIRCLE INQUIRY NO. 125

Card Cages

Cromemco has three S-100 bus card cages to handle OEM or individual system requirements.

The cages are available as an 8-slot, 12-slot or 21-slot version. The backplanes include a full set



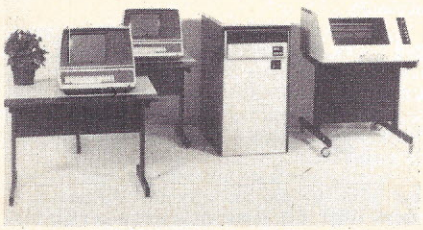
of edge connectors wave-soldered in place on Cromemco's exclusive Blitz Bus™.

Prices are $195 for the 8-slot (Model CC-8), $245 for the 12-slot (CC-12) and $395 for the 21-slot (CC-21). Contact Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043.

CIRCLE INQUIRY NO. 126

First-Timers Business System

The Rexon Multi-Terminal Systems (MTS) models RX10 and RX30 are based on a 16-bit microcomputer tailored to run high-level language business programs that can serve clerical-level and other non-computer-oriented personnel.



Systems will be sold through qualified non-exclusive dealers for turnkey placement in customer environments. Prospective users will be accounting departments in businesses with

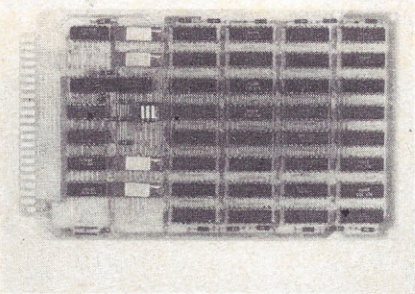
annual revenues from $500,000 to $25 million.

Contact Rexon Business Machines Corp., 5800 Uplander Way, Culver City, CA 90230.

CIRCLE INQUIRY NO. 127

Memory Microboards

Three memory microboards from RCA provide additional ready-to-use hardware for custom applications of microprocessor-based computer equipment.



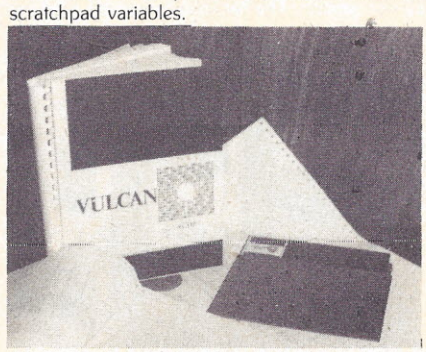
The Microboard memories include the CDP 18S21V1 16K RAM, the CDP18S623 8K RAM and the CDP18S624 4K battery-backup RAM. Each module features static CMOS components with low-power, high-noise immunity advantages and operates from a 5-volt supply.

For details contact RCA/Solid State Div., Route 202, Somerville, NJ 08876.

CIRCLE INQUIRY NO. 128

Data Base Management System

SCDP announces the VULCAN Data Base Management System. VULCAN is a complete DBMS system that has 38 English language-like commands to manipulate files, records, fields and scratchpad variables.



VULCAN is an 8080 microcomputer implementation of a Large Scale Computer user-oriented DBMS system. It is written in 8080 assembly language and operates on 8080 or Z-80 systems under CP/M or PTDOS.

For details contact Software Consultation, Design and Production, 6542 Greeley St., Tujunga, CA 91042, (213) 352-7701.

CIRCLE INQUIRY NO. 129

Versatile Data Communications Board

National Semiconductor Corporation has a data communications board that provides eight independently programmable RS232C channels for communications expansion on board level computers.

The BLC-8538 is based on the 2651 USART. A four-channel board, the BLC-8534, is also available.

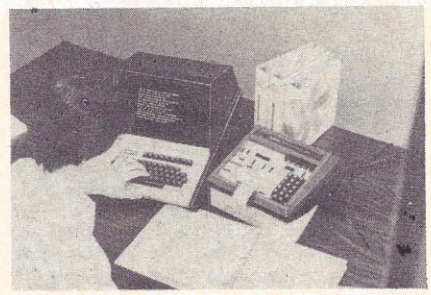
Under user control, each channel can be specified either synchronous or asynchronous, can have individual data formats or parity, has 16 software-programmable baud rates up to 19.2KB or external inputs, has double buffering for full-duplex transmissions and has individual parity error detection.

Prices for 1 to 9 are $999 for the eight-channel and $750 for the four-channel. Delivery is 4 weeks ARO. For more information contact National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, CA 95051.

CIRCLE INQUIRY NO. 131

Microprocessor Accessory

Heath Company has introduced a Microprocessor Trainer Accessory that converts the Heathkit ET-3400 Microprocessor Trainer into a personal computer.



The ETA-3400 Accessory gives the Trainer uses beyond a training device by providing up to 4K of additional RAM, a new monitor and a tiny BASIC interpreter in ROM, plus audio cassette and video terminal interfaces.

For details or a free catalog, write Heath Co., Dept. 350-910, Benton Harbor, MI 49022.

CIRCLE INQUIRY NO. 130

External Calculator Keypad

A new external computer keypad for the TRS-80 is available from VR Data. The keypad offers 14 operations — a double-width zero key, numerals 1-9, plus, minus, and enter — in calculator format.

A three-foot connector is supplied with the keypad, which provides operation for both right and left handers.

Price with connector is $64.95. Contact VR Data, 777 Henderson Blvd., Folcroft Industrial Park, Folcroft, PA 19032.

CIRCLE INQUIRY NO. 132

S-100 Video Graphics

The VG100 is a single card high density computer display system for text oriented applications. The 80-character wide VG100 has totally programmable fonts allowing any character set up to 256 characters to be defined in on-board RAM with available software, or create musical notes, logic and mathematical symbols as characters.

Every 8-bit character has an attribute byte which allows the charcter to be modified up to 256 different combinations.

For details contact International Product Development, Inc., 1708 Stierlin Rd., Mountain View, CA 94303, (415) 969-6086. Price is $895.

CIRCLE INQUIRY NO. 134

Impact Matrix Printer

The Model 801 from Impact Data Inc. is a low-cost impact matrix printer for use with microcomputers such as the Radio Shack TRS-80, Apple II and Compucolor.

Mechanical features include a high quality, stepper motor driven integral tractor mechanism for precision incremental paper motion with both forms width and thickness adjustments; a continuous loop ribbon with re-inking roller; extended MTBF with only 2 moving parts to drive the print head and drive motors that run only while printing.

Prints 132 cps, 80 columns wide. Contact Vitek, 1160 Barbara Dr., Vista, CA 92083, (714) 724-0210, Tom Pine.

CIRCLE INQUIRY NO. 135

Miniprinter Speed Doubles

Centronics Data Computer Corporation has doubled the speed of its 730 miniprinter Series to 100 characters per second.

All of the international Centronics miniprinters include such standard features as 80-column line length at 10 characters-per-inch, a full line buffer and high speed carriage return.

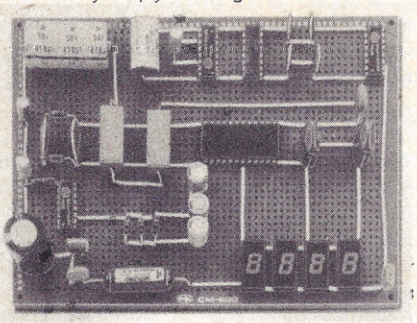
The printers' typewriter-like platen takes 8½-inch wide letterhead in letter, legal or longer lengths. Fixed pins on the platen accept standard computer-grade multi- or single-part fanfold paper or 8½-inch wide roll paper.

For details contact Centronics Data Computer Corp., Hudson, NH 03051, (603) 883-0111.

CIRCLE INQUIRY NO. 136

Solderless Prototype Board

CM-600 is a system for solderless construction of circuit prototypes. The CM-600 is a neoprene board 4½ x 6" with 2280 holes on .100" centers. Standard components including DIPs are mounted by simply inserting leads into the holes



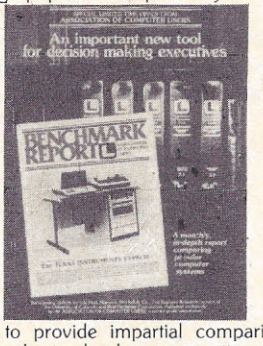
in the neoprene material. Interconnections are made using 20 or 22 AWG wire jumpers.

For details contact O.K. Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475.

CIRCLE INQUIRY NO. 137

Brochure on Benchmark Reports

Complete information on the Association of Computer Users' (ACU) Benchmark Report series is featured in a free six-page brochure. The Benchmark Report is a monthly, 24-page report comparing popular computer systems. It is



designed to provide impartial comparisons to decision makers who have computer selection responsibility. The report is being published in three 12-issue series.

For a free copy contact the Association of Computer Users, P.O. Box 9003, Boulder, CO 80301, (303) 499-1722.

CIRCLE INQUIRY NO. 138

Integrated Computer Learning

Sterling Swift Publishing offers the text "Computers and Data Processing" by David Groves and Jim Poirot which is an introductory text that assumes no background in computers or mathematics. Enables students to learn problem solving techniques through general background information, flowcharting and programming in the BASIC language.

Offered in combination are "hands off/hands on" workbooks on data processing and programming with available software.

The book is $14.95; workbooks $3.95 each. For details contact Sterling Swift Publishing Co., P.O. Box 188, Manchaca, TX 78652.

CIRCLE INQUIRY NO. 140

Brochure on OIS/125

A two-page brochure from Wang Laboratories describes the Office Information System (OIS)/125, which retains up to 2,000 pages on its 5MB disk, accommodates an additional disk with 2.5MB of removable media, and supports

up to 14 peripherals. The literature discusses the system's capabilities and highlights some of the available options, including the Wang Inter-System exchange.

For details contact Wang Laboratories, Inc., One Industrial Ave., Lowell, MA 01851.

CIRCLE INQUIRY NO. 139

32K RAM for Heath H8 Computer

D-G Electronic Developments offers the DG-32D RAM board configured with 32K bytes and consuming less than 6 watts power. Ready to plug into the H8 and use without additional wiring. Will operate with or without the present static memory in the computer.

Full compatibility with current Heath peripherals. Other features include circuit protection and memory addressing controlled by DIP switch.

For details contact D-G Electronics, 3223 Forest Lane, Garland, TX 75042, (214) 840-2700, Joe Darby.

CIRCLE INQUIRY NO. 141

Micro Composer

Micro Music Inc. announces Micro Composer, an Apple II compatible music system. A step-by-step instruction manual leads the user through entering, displaying, editing and playing music with up to four voices and a four-octave range.

Micro Composer comes with an instruction manual, software disk (or cassette) and the Micro Music DAC music card.

Contact Micro Music Inc., University Plaza, Suite 8, 309 W. Beaufort, Normal, IL 61761.

CIRCLE INQUIRY NO. 142

Software for the PET/CBM

Three new software packages are available for the Commodore PET/CBM. These easy-to-use programs from Total Information Services (TIS) provide practical applications for computers at home or at the office.

The programs are for checkbook, accounts and calendar purposes. A Mailing List program and a Micro Text Editor are other programs offered. All software packages include a cassette copy of the source program, a source listing and a complete manual of instructions with step-by-step examples.

For details contact TIS, Box 291, Los Alamos, New Mexico 87544.

CIRCLE INQUIRY NO. 143

Apple II for the Arab World

Multi-Media Video, Inc. has a bilingual Arabic/English version of the Apple II microcomputer. This system operates entirely in Arabic: input, output, error messages, and BASIC commands and therefore does not require knowledge of the English language.

With dual Arabic-English monitor, character generator, text selection, commands, bilingual keyboard and software programs.

Contact Multi-Media Video, Inc., 3350 Scott Blvd., Bldg. 21, Santa Clara, CA 95051, (408) 727-1733, Telex 171 577 MMV USA.

CIRCLE INQUIRY NO. 146

Review by Alan R. Miller, Software Editor

Word-Master MicroPro's Video Editor for CP/M

INTRODUCTION

The most important program in the system library is the text editor. It is used to create an ASCII source file for the assembler, FORTRAN, BASIC and the text formatter TEX. Then it is used to make additions or corrections to these files. It was just a short time ago that CP/M users had only a single text editor. Now there are four.

A text editor called ED is supplied with the CP/M operating system as a separate executable program. ED was reviewed in the July, 1978, issue of INTERFACE AGE. A second text editor, EDIT-80, which is available from Microsoft, was reviewed in July, 1979. EDIT-80 is especially useful for working with FORTRAN and BASIC source programs. Microsoft, Xitan and Tarbell BASIC all incorporate a self-contained editor. But they also are able to utilize programs generated independently by the system editor.

A third CP/M text editor, the ED-80 by Software Development and Training (SDT), was reviewed in December. ED-80 is especially suitable for line-oriented text. Basically all three of these editors are hard-copy oriented, with some limited video features. The SDT editor is probably the best in this regard.

A NEW APPROACH

Word-Master by MicroPro presents a whole new concept in text editing. It contains essentially all of the commands of the original CP/M text editor ED. In addition, there is a completely separate set of video-oriented commands. A minimum of 20K bytes of memory is required, but 24K to 30K would be better.

The video portion is designed for true serial video terminals such as the Lear-Siegler or SOROC. Word-Master, however, can also be adapted to memory-mapped video terminals such as the Processor Technology VDM-1.

INITIALIZING WORD-MASTER

Word-Master is used to create or alter an ASCII file by the command:

```
A>WM filename.ext
```

The user may want to rename Word-Master to something more descriptive like EDIT:

```
A>REN EDIT.COM=WM.COM
```

Then Word-Master can be invoked with the command:

```
A>EDIT filename.ext
```

If a new file is being created, Word-Master clears the video screen and displays the message:

```
NEW FILE
```

Video mode is then entered. Alternately, if an existing file is to be altered, part of the file is automatically copied into memory. The video screen is filled with the first lines of the file. There is no need for an append command such as the one in ED.

The cursor is a reverse-video representation of the underlying character. It initially appears in the upper-left corner of the screen.

CURSOR-MOVEMENT COMMANDS

The cursor can be moved anywhere on the video screen while in video mode. Four basic commands move the cursor one space left, down, up, or right. They are, respectively, a Control-H, Control-J, Control-K, and Control-L (^H, ^J, ^K, and ^L). These four commands are the standard cursor-movement controls typically found as separate keys on video terminals.

Since the letters H, J, K and L are adjacent to each other on the same row of the standard keyboard, they can be readily manipulated with the right hand. Control-J is also the ASCII line feed, the Control-H is the ASCII backspace.

There are additional cursor-movement keys. Pressing the carriage return moves the cursor to the beginning of the next line. Control-T or Control-^ alternately moves the cursor to the top and bottom of the screen. Control-B alternately moves the cursor to the beginning and end of the current line.

MOVING TO THE NEXT WORD

The cursor can be moved to the next word (jumping a line if necessary) by typing a Control-D. The cursor is moved to the beginning of the prior word with a Control-A. The definition of a word in this context is sometimes interesting. Printable characters such as the period, comma, semicolon, dollar sign, etc., are treated strangely.

If they appear singly between two letters or numbers, such as 8-14-79, they are treated like spaces. Suppose, for example, that the cursor is located over the number 8 in the above example. Typing a Control-D will move the cursor to the number 1, skipping over the minus sign.

But if more than one of these other characters appears together, each one after the first is considered to be a word. For example, if the cursor were positioned over the asterisk in the expression *$38, then a Control-D would move the cursor one space to the dollar sign. A second Control-D would move the cursor to the number 3.

Table 1. Word-Master video-mode commands that change the display, but do not alter the original text.

^H	Cursor left (backspace)
^J	Cursor down (line feed)
^K	Cursor up (vertical tab)
^L	Cursor right
^M	Cursor next line (carriage return)
^T	Cursor top/bottom (toggle)
^B	Cursor left/right (toggle)
^D	Cursor next word
^A	Cursor previous word
^Z	Cursor next tab position
^X	Scroll up one line
^E	Scroll down one line
^C	Scroll up one screen
^R	Scroll down one screen
^W	Do next command 4 times
^W^C	Scroll up four screens
^W^W^X	Scroll up 16 lines
^W^W^W^L	Cursor 64 spaces right

FILE-MOVEMENT COMMANDS

The file is moved upward one line on the video screen with the Control-X command. It is moved downward one line with a Control-E. A Control-R scrolls the file downward one screenful and a Control-C scrolls the file upward one entire screenful. One of the nice features of Word-Master is that it preprocesses all commands. Thus a Control-C does not perform a CP/M warm start, aborting the edit session, as does ED.

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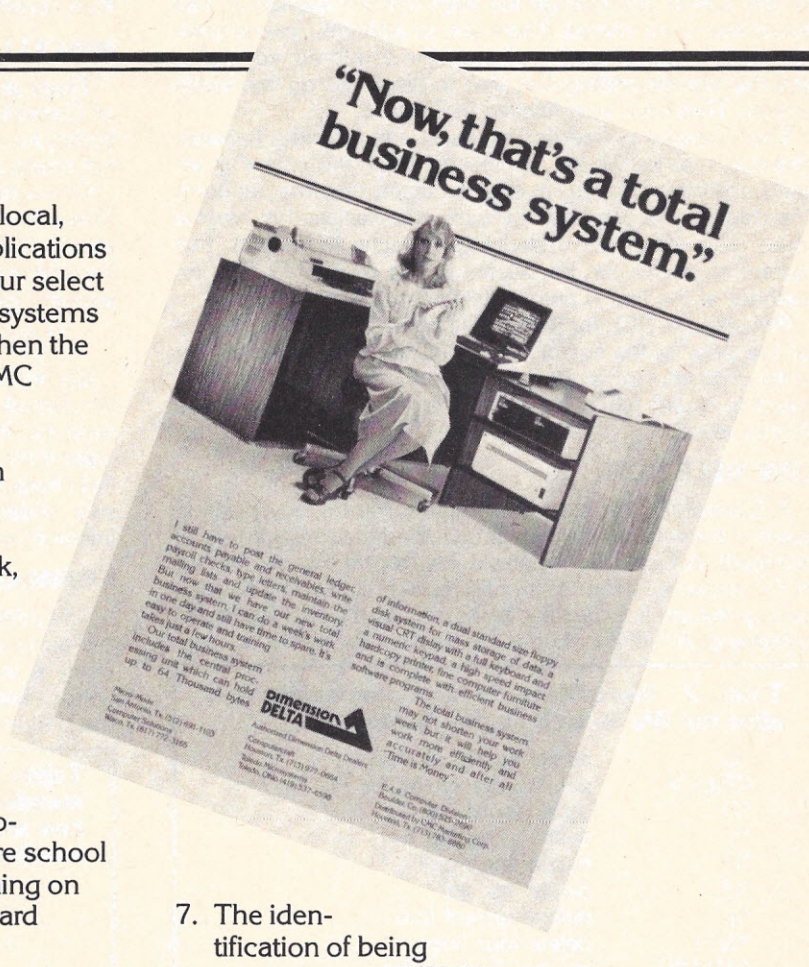

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A unique feature is the Control-W command. It causes the command following it to be repeated four times. Thus a ^W^D will move the cursor four words to the right. A ^W^X sequence will scroll the video screen up four lines. A Control-W will accept itself as an argument. A ^W^W^E will scroll the file down 16 lines if possible, and a ^W^W^W^L will move the cursor 64 characters to the right.

DELETION OF TEXT

The commands described above simply move the cursor on the screen and change the lines that are displayed. The actual text is not altered. There are, in addition, several commands that can be used to change the text in the edit buffer and the corresponding text that is displayed on the video screen. These are summarized in Table 2.

The character pointer for the usual editor resides between characters. Word-Master is different since the cursor is actually positioned directly over a character, or carriage-return, line-feed. In video mode, the cursor is displayed in reverse video. This allows the underlying character to be read. The current character can be deleted with a Control-G. The remainder of the line is automatically moved to the left.

Pressing the DEL (or RUBOUT) key will delete the character just prior to the cursor. Control-O deletes the remainder of the current word, starting at the cursor position. This command is useful when overwriting an existing word with a shorter word.

LINE DELETION

A Control-P deletes text from the current cursor position down to the end of the line (not including the carriage-return, line-feed). A Control-U deletes a line from the beginning up to the cursor position. The entire current line, including the carriage-return, line-feed this time, is deleted with a Control-Y command. A ^W^Y can be used to delete the next four lines.

Table 2. Word-Master video commands that alter the file as well as the display.

^G	delete cursor character
<DEL>	delete prior character
^O	delete word right
^\	delete word left
^P	delete line right
^U	delete line left
^Y	delete current line
^W^Y	delete four lines
^W^W^G	delete 16 characters
^N	insert carriage-return, line-feed
^I	insert ASCII tab
^F	toggle insert mode
^]X	put X into buffer

ADDING TEXT

Text can be placed into the edit buffer in several ways. Existing text can be overwritten just by typing the new version right over the old. If the new line is longer than the original, the user just keeps typing. The carriage-return, line-feed pair at the end of the original line is automatically moved to the right. If the new line is shorter than the original, a Control-P deletes the rest of the old line.

If more than one line is to be added, type a Control-N several times (or a ^W^N). Each Control-N adds a carriage-return, line-feed pair and moves the remainder of the text downward on the screen.

INSERT MODE

If only a few characters are to be inserted into existing text, the command of Control-F can be given. This turns on the video-insert mode. All non-control characters and the ASCII tab are entered into the file. The existing text in the edit buffer and on the screen is moved over. In insert mode, the cursor appears as a "less-than" symbol (<) rather than as the usual reverse-video character.

When insert mode is turned on, the cursor-movement and file-movement commands operate in the usual way, although the carriage-return key is an exception to this. Moving the cursor up or down from the current line does not turn off insert mode as it does in the Electric Pencil.

The character-delete, word-delete, and line-delete commands also work in the usual way during insert mode. Insert mode is terminated by typing another Control-F. The cursor then reverts back to the reverse-video mode.

MISCELLANEOUS COMMANDS

There are a few additional video commands. A command of Control-] will place the following character into the edit buffer, no matter what it is. This allows the user to insert control characters other than carriage return, line feed, and tab.

Of course, care should be exercised when the ^] is used. There is a special error message waiting for the user who tries to place the CP/M end-of-file character, Control-Z, into the edit buffer. In this case, Word-Master responds with the impolite expression

TURKEY

Control-Q displays a summary of the edit commands if the file named WM.HLP is present on the disk. A Control-V will send the following character to the user's console, but not enter it into the edit buffer. This allows the user to send control characters, such as a clear-screen command to the console. Video mode is terminated, and the command mode is invoked by pressing the <esc> key (^]).

COMMAND MODE

The editing commands in command mode are essentially the same as with the regular CP/M editor ED. Command mode is indicated by a star prompt at the beginning of the bottom line on the video screen. The commands are summarized in Table 3.

Table 3. Word-Master command-mode commands. The optional n is the repeat factor. It can usually be either a negative or a positive number.

nC	move pointer n characters
nL	move pointer n lines
nT	type n lines
nP	move and print n pages
nD	delete n characters
nK	kill (delete) n lines
nZ	delay (sleep, z-z-z)
n	move n lines, type the last
<LF>	move to next line
nA string	append string
B	move pointer to file beginning
—B	move pointer to file end
F	find string (short)
N	find next string (long)
S	substitute string (short)
R	replace string (long)
I	insert text
W	write disk file
Y	read (yank) disk file
nM	multiple operations
n<...>	same as nM
V	enter video move
E	normal end of edit session
H	end edit and restart session
Q	quite (abort)
O	return to original file
Qn	scratchpad operations

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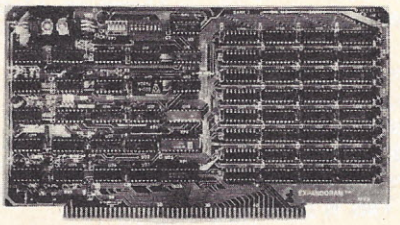

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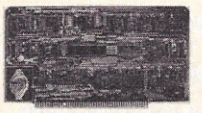
PROM-100 Board Kit $149.95

SD'S MPB-100 Z80 CPU BOARD KIT



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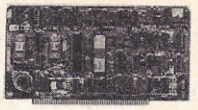

SD'S VDB-8024 VIDEO DISPLAY BOARD

The VDB-8024 features its own on-board Z80 microprocessor. This gives the capability of using software (included in ROM) to control functions and enhancements without interference with the computer's CPU. Included in the special features: 80 characters by 24 lines display, keyboard power and interface, composite and separate video output, 2K on-board RAM, a total of 256 available characters, full cursor control, forward and reverse scrolling, underlining, field reverse, field protect enhancements, programmable characters. **VDB-8024 KIT $289.00**

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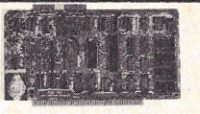

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The SBC-100 provides a complete micro-computer on a single board! The Z80 microprocessor is used as the heart of the SBC-100. The SBC-100 meets all the requirements of a Z80 CPU board with the added features of I/O ports, counter/timer channels, on board RAM, provisions for PROM/ROM and a software programmable baud rate generator. S-100 Bus compatible, the SBC-100 features are: 8K bytes of available PROM, 1024 bytes on-board RAM, Serial I/O with both synchronous and asynchronous operation, Parallel I/O ports, Operational Vectored Interrupts, and Four Counter/Timer Channels. SD Monitor available for RS-232 and Video Terminals. Disk based system software also available.

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28	.39	20	.26

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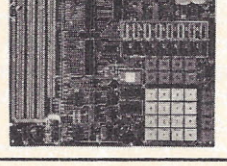

DIP SWITCHES

3 Pos.	**$1.10**
4 Pos.	**$1.12**
5 Pos.	**$1.16**
6 Pos.	**$1.20**
7 Pos.	**$1.22**
8 Pos.	**$1.26**
9 Pos.	**$1.36**
10 Pos.	**$1.30**

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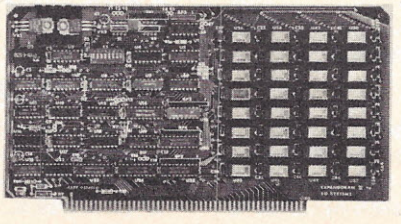

SD Systems' ExpandoRAM II is a dynamic RAM board with capacities from 16K bytes (4116) to 256K bytes (4164). It operates on the industry S-100 Bus. The design allows 8 boards to operate from the same S-100 Bus. The ExpandoRAM II is compatible with most S-100 CPU's based on the Z80 microprocessor.

EXPANDORAM II KIT

W/O	**$195.00**
16K	**285.00**
32K	**375.00**
48K	**465.00**
64K	**555.00**

CIRCLE INQUIRY NO. 94

HOLIDAY SPECIALS For Orders Received BEFORE December 31, 1979

GLOBAL FIND AND SUBSTITUTE

There are two global find and two global substitute commands. The F command, for find, and the S command for search, operate as they do in ED with one exception. The search is only performed over the next 2000 characters or so. This short-search pair is complementary to a long-search pair. The N command, for next, finds the next occurrence of the string argument, searching through the entire remainder of the file if necessary.

The R command performs a string replacement, searching the entire file, if necessary, for a match. Since Word-Master does not normally load the entire file into memory, the short-search commands F and S should be used whenever possible. If a long search is anticipated, then the entire file should be loaded into memory if possible. This is done by first giving the command of —B.

The four search commands may be preceded by a number indicating how many times the operation is to be performed. A # symbol indicates a maximum number of times (65,535).

CONTROL CHARACTERS IN THE SEARCH STRING

The search string may contain control characters. The ASCII tab character can be entered as a regular character. A Control-N in the string refers to a carriage-return, line-feed pair. (This is equivalent to the ^L in ED.) A Control-A is placed in the search string to indicate a wild card. Thus:

```
*FSORT^A
```

will look for the first occurrence of the set of SORT1, SORT2, SORT3, etc.

Two control characters are unique to Word-Master. A Control-S in the search string is used to indicate any character except a letter or number. For example,

```
*NSORT^S
```

will look for SORT but not SORT1, SORT2, etc. A Control-O has an interesting interpretation. A match occurs if the corresponding character is anything except the one following the ^O.

LOOPS

As with ED, several commands can usually be given on a single line. In addition, a block of commands, including the global find or substitute commands, have one of two formats. Either they are preceded by an M or they are enclosed in angle brackets. The commands:

```
*MRstring1$string2$OTT      and
*<Rstring1$string2$OTT>
```

are equivalent. They change all occurrences of string1 to string2 and print each new line. Strings in the find and substitute expressions can be delimited with a Control-Z, as with ED, or with an <ESC>. A $ symbol is echoed on the console in either case.

The M or angle bracket may be preceded by a number to indicate how many times the loop is to be performed. Word-Master commands generally have a default value of one. That is, if there is no preceding number, then the command is executed once. The loop command is an exception. A value of 65,635 is selected in this case if the repeat value is omitted.

A COMBINATION OF COMMAND AND VIDEO MODE

An example of a powerful combination of command mode and video mode is given in the following example:

```
*BMNstring$V
```

The B command moves the pointer to the beginning of the buffer. Next, the MN combination searches for all occurrences of the desired string. The $ symbol is the echo for the string delimiter of <ESC> or Control-Z. As each occurrence of the string is located, the V command forces conversion from command mode to video mode. This temporarily halts the search. The user can then inspect the context and make changes if necessary. Typing an <ESC> will convert back to command mode, so that the search can continue.

Care must be taken when using this combination of commands. The editor will be in video mode most of the time. Therefore, a Control-C cannot be used to prematurely abort the operation. For example, a command of

```
*MNA$V
```

may take a very long time to complete since the process will stop at each occurrence of the letter A. One way to abort this operation is to repeatedly send the ASCII escape character from the console.

FILE HANDLING

As with ED, there are provisions for copying line of the edit buffer to a disk file, and conversely, copying a disk file into the edit buffer. There is the added versatility that disk files may be on any disk drive. Also, the filename can have any extension, although LIB is the default value if the extension is omitted.

A disk file is created while in command mode with the W (for write) command. A T (for type) command should be given first to view the actual lines that are to be saved on disk:

```
*20T
*20WB:MOVE$
*—20K
```

The first line, in the above example, types on the console the next 20 lines following the cursor. The second line writes these lines to a disk file on drive B, assigning the filename MOV.LIB. At the completion of the W command, the cursor will be located at the end of the 20 lines. The third line can now be used to delete the 20 lines from the edit buffer.

THE SCRATCHPAD BUFFER

The scratchpad memory is another unique feature of Word-Master. A separate buffer is provided in main memory that can be used like a high-speed disk area. The scratchpad commands, which all begin with Q, are much faster than the corresponding disk operations.

A command string can be placed into the cache (complete with comments), then the string can be repeatedly executed as if the commands were given directly from the console. The scratchpad commands are summarized in Table 4.

Table 4. The scratchpad (cache) commands.

nQP	put n lines into cache (delete from edit buffer)
n/QP	append n lines to cache (delete from edit buffer)
nQG	copy cache to edit buffer n times
QT	type cache contents
QK	kill (empty) cache memory
QLstring	load string into cache
n/QLstring	append n copies of string to cache
QX	execute commands in cache memory
;	comment follows

The /QP, like the QP command, is used to transfer lines from the edit buffer to the scratchpad memory. The difference is that in this case, the new lines are appended to the existing lines in the cache. The original lines in the edit buffer are deleted as they are for the regular QP command.

NON-STANDARD TAB STOPS

The nQG command can be used to insert n copies of the scratchpad contents into the edit buffer. This command can be used to set up non-standard tab spacing. This is especially useful for COBOL. In video mode, a one-line prototype template

is written into the edit buffer using the desired number of spaces and a character such as the lower-case letter l:

```
l   l     l   l   l l
```

The cursor is moved to the beginning of the line with a ^B command and command mode is invoked by pressing the <ESC> key. The scratchpad command QP is given to copy the prototype line into the cache memory. A command of, say:

*1000QG

produces 1000 lines of the prototype back into the edit buffer.

When the user returns to video mode, there will be a lower-case L at each tab position on the first 1000 lines. Control-D now becomes the new non-standard tab key. Each time ^D is pressed, the cursor moves to the next occurrence of the letter L.

Any extra lines of L can be removed at the end of the edit session by entering command mode, moving the cursor to the back end of the file, and giving the #K command.

ENDING THE EDIT SESSION

There are several commands that can be given (while in command mode) to terminate the editing session. A command of E will end the session in the normal way. The file type of the original file, if any, is renamed to BAK and the new file is given the name of the original file.

A command of H ends the session normally, as if an E were typed. But then the editor is automatically executed again. This H command should be given frequently during the edit session so that the current file will not be lost in case of a power failure or hardware problem.

A command of O (for original) will abort the current session and reload the original file. This might be necessary if a complex, multiple command were incorrectly typed. In this case, the original back file (if any) is deleted. A command of Q (for quit) aborts the session if the user answers the question:

ABORT (Y/N)?

with a Y.

When DISK FULL appears, there are several ways to save the edited file. The first thing to do is to move the cursor to the beginning of the file with the B command (when in command mode). Then if there is space on another drive, e.g., drive C, use the W command to write the entire file:

*#WC:NAME.EXT

It there is no room on any drive, it may be possible to delete an existing disk file by a sneaky method. The W command deletes an existing file if present, but only after the copy operation. Therefore, first give the command:

*1WC:OLDFILE.EXT

to copy a single line to the disk and delete the entire original file. This will free up most of the space that was occupied by the file called OLDFILE. Then, move the pointer to the beginning of the edit buffer and do a complete save with the write command:

*B#WC:OLDFILE.EXT

using the same old-file name. Exit from the edit session with the Q command so that no further text will be saved. Then rename the original file extension to BAK and rename OLDFILE.EXT to the proper name.

CONCLUSION

Several new text editors for CP/M have become available this past year. But none of the other editors have the power and versatility of MicroPro's Word-Master. The ability to directly manipulate text anywhere on an ordinary, serial video terminal gives the user an extremely powerful tool. With this great power, of course, comes the potential for a major error. By and large, Word-Master is a fantastically powerful CP/M text editor.□

Computing Your Genealogy

By Jim Schreier, Associate Editor

Nature has given to each and every one (with no known exceptions) exactly one mother and one father, both free of charge. For this reason alone, getting into genealogy is much cheaper from the start than stamp or coin collecting. This may be one reason the field remains so popular today.

Genealogy is more fun than a good computer game. It is a mixture of adventure, chance, discovery and research, plus a little common garden variety of luck. And, of course, the random number generator is always locked on the powers of two. Within four generations you may find yourself researching everyday life of 100 years ago. You may be digging in old records for a great grandparent only to find a speed limit warning for horses on the local bridge. Five miles an hour, and strictly enforced. Or a relative who went to jail for some now-forgotten misdeed.

Until now the details of a genealogy were kept on paper. The objective of these programs is not to outdate "paper" genealogies. Instead, they are programs to record and recover varied amounts of information about one's ancestors. The MICRO/ROOTS Genealogical Programs are different from "paper" genealogies, yet compatibility has been maintained with traditional methods of record keeping. This means one may transfer a "paper" genealogy to these programs; or vice versa.

Two standard forms are used in recording genealogical information: The Pedigree and the Family Group. The Pedigree is a generation-by-generation movement by the powers of 2 into the past. You start with yourself. (You are the first generation). Your parents (2) are followed by grandparents (4), great grandparents (8), great-great grandparents (16) and so forth. If this is confusing, remember generations are like the binary number system, each position being expanded by the powers of 2.

The Pedigree assigns each generation (with the exception of you), specific ancestor numbers. By convention an even ancestor number denotes a male; an odd ancestor number denotes a female. A Pedigree may display one's lineage as far as records may be found for its support.

The Family Group record is the heart-and-soul of genealogical records. Here, under the name of the father, the wife and children are recorded in detail. The Pedigree may be thought of as a map to the Family Group records. One of the children in each Family Group will be of special interest. This is the direct ancestor, one of your direct grandparents that appears on your Pedigree.

APPROACHING COMPUTERIZED GENEALOGY

Genealogy records are generally family based. The MICRO/ROOTS approach is, instead, based on a given individual. It is not necessary to know a family to find the information. One only need know the name of the individual. The programs are designed to recover from sequential disk files the necessary individual information (name, sex, birth, mother and father), the marriage information, the children and the death information.

Why all this detail? Because of all the people who have lived, very few, if any, would have the same information. In other words it is very unlikely that two "John Smiths" would both be born on the same day, in the same place, have the same parents, marry the same wife, raise the same named children, and then die on the same day at the same place. Of course, it could happen. That's probably why governments came up with Social Security numbers.

One problem with given and surnames is the variety of spellings during different time spans. Anyone familiar with computers may know that most higher level languages may not distinguish the subtle variations names may undergo. To overcome this problem, MICRO/ROOTS uses an index to the sequential disk files. This will permit examining the genealogical records of the proper individual.

Genealogical records fall into two categories. The first are fixed files, name, parents, date and place of birth; the second are variable files, marriages and children. Three disk files are necessary for each individual. The movement of the files will be transparent to the user. In the main record program, genealogical information of an individual will be displayed in one continuous cycle until the three files are exhausted. The output may be directed to SWTPC I/O port #7 for hard copy. Converting the programs to TSC's new 6800 BASICs requires a different statement. The TSC channel 0 (zero) needs to be opened. For example, OPEN "0.PRINT" AS 0 (zero) and CLOSE 0 would have to be entered into the source code. If the TSC BASICs are used, the variable Q need not be used at all.

The Hardware

The MICRO/ROOTS Genealogical System was composed using the SWTPC 6800 computer with 20K RAM, the SWTPC dual minifloppy disk and Disk BASIC v 3.0. The programs can be run directly on the full sized SWTPC DMAF1 system. The programs may be adapted to TSC's disk versions of BASIC. If this option is elected the LINE=, DIGITS= and EOF statements will not be supported. TSC's lack of disk EOF statements causes programming complications. As such, the original SWTPC Uiterwyk disk BASICs is recommended for these programs. A number of the programs reference miniFLEX™ date calls. As such, the variable D9 should be set to decimal 44046 if FLEX2™ is being used.

The minimum terminal is 64 columns by 16 lines. Each program contains a subroutine to clear the CRT screen and home-up the cursor. This subroutine should be adapted to your specific needs. Likewise the date recording and date recovery subroutines may be adapted to meet your specific system. The programs require the use of the date which, if defeated, would remove an important element from the programs.

Program Descriptions

The first program, MAIN.BAS, allows for progressive CHAINING of the nine programs. While entering the listings it is recommended that any lines with CHAIN commands be protected by placing REM statements at the beginning of the line. For example, the line IF X=1 THEN CHAIN INDEX. BAS, 10: END should be entered as REM IF X=1 THEN CHAIN INDEX. BAS, 10: END. This offers security.

All too often one enters a listing with CHAIN statements only to RUN the program looking for bugs and discovering the system encountered a CHAIN command. Unless protected, the CHAIN command proceeds to look for the required program, dumping your newly entered program. For debugging purposes the STOP statement may be used to preserve the listing in lieu of the CHAIN commands.

The second program is for individual file creation. INDIVID. BAS requires both generation and ancestor numbers. These numbers may be found on the Pedigree chart, Figure 1. Ancestor numbers are related to sex. Lines 260 to 340 check to see that sex-correlated ancestor numbers are given.

If not, an error statement occurs. Likewise, the ancestor number must correlate with the generation. The program detects an ancestor number 4 within the third generation. (See lines 350 to 410).

If the sequence is not maintained, another error message is displayed. This is done by calculating the number of ancestors within a generation and comparing the acceptable figures to those input. It is necessary to alter the result [LET X1 = INT(G^(G—1) + .1)] because the SWTPC BASIC gives slightly altered and somewhat inconsistent calculations. Other BASICs may use LET X1 = INT(G^(G—1)) with no problem.

The third program, INDEX.BAS, is used to display those individuals created. Responding "Y" to the question "DO YOU WANT THE PRINTER" will direct I/O to port 7. Selecting this option without a printer a port 7 will cause the program to hang-up and all information will be lost. Other ports may be called by altering the variable "Q".

The fourth program creates marriage records. MARRG. BAS uses information given in the individual files as a "check and balance." The programs assume you are entering a large amount of information during the initial sitting. As such, a certain amount of checks are necessary to maintain consistent information. The update programs do not support these types of checks. However, the update programs may be altered to include the checks if you feel it is necessary.

The CHILD.BAS program continues "checks and balances" as it creates the children's disk files. The children's files are written so that the children may be recovered using either the husband's or wife's name.

RECORD.BAS is the individual genealogical display and is the most complex of the nine programs. All disk files are opened and read. The output is similar to the Family Group record. (See Figure 2).

The remaining files are used to update files already created. Each file is opened, read into a temporary file, new information is added, the old file is destroyed and the temporary file receives the old file's name. In this manner additional information may be added any time. Input corrections or new information may be added to the main files by using the ALT programs. ALT.BAS alters individual and marriage records. CHALT.BAS alters children's files.

This Genealogical System may expand as your research grows. Additional programs may be written. For example, a reading of all geographic locations may be helpful, especially in foreign research. An alphabetizing routine may be added to the INDEX program so individuals can be presented in alphabetical instead of sequential order.

Getting Started

Getting going with genealogy is as simple as asking your relatives questions. Remember, the object is to record all key information, dates and geographical locations. After 1900 most states have birth and death records. They are usually kept in the State Department of Health. Some states, like South Dakota, did not begin keeping birth and death records until the early 1950s. The counties in these states may have birth and death records along with marriage and divorce records. Many Eastern cities have birth and death records going back many generations.

Along with information from relatives, begin collecting scrap books, photographs and documents from around the house. These items usually contain a wealth of genealogical information. It is not unusual to find three generations of material around the house.

Once you have started you may wish to visit your local public library or bookstore and review many of the popular genealogical books. Your research will provide a priceless treasure for you and your children, enhancing your personal involvement with those who passed before.□

Figures and Program Follow

Figure 1.

```
                INDEX BY INDIVIDUAL
                  DECEMBER 25, 1979


ENTRY   INDIVIDUAL            GENERATION  ANCESTOR    BIRTHDATE
  1     JOHN DOE (M)               3          6       1 JAN 1900
          ENTRY NUMBER 1 RECORDED: 6-15-1979

  2     HELEN WHITE (F)            3          7       4 APRIL 1903
          ENTRY NUMBER 2 RECORDED: 6-15-1979
```

Figure 2.

```
                INDIVIDUAL GENEALOGICAL RECORDS

                          * * *


     THE RECORDS OF:  JOHN DOE  (M)
     GENERATION: 3
     ANCESTOR NUMBER: 6
     DATE: JANUARY 1, 1980

    GENEALOGICAL INFORMATION                    DATE RECORDED

 BIRTHDATE: 1 JAN 1900                             6-15-1979
 BIRTHPLACE: TUSCON PIMA AZ                        6-15-1979
 FATHER: AARON DOE                                 6-15-1979
 MOTHER: SUSAN GREEN                               6-15-1979


       * MARRIAGE RECORDS
       NUMBER OF MARRIAGES: 2                      6-15-1979

   MARRIAGE NUMBER 1
 SPOUSE: HELEN WHITE                               6-15-1979
 MARRIAGE DATE: 14 JULY 1921                       6-15-1979
 MARRIAGE PLACE: PHOENIX MARICOPA AZ               6-15-1979

   NUMBER OF CHILDREN BY THIS MARRIAGE 1

       * CHILDREN

          CHILD NUMBER: 1
 CHILD'S NAME: JAMES DOE  (M)                      6-15-1979
 CHILD'S BIRTHDATE: 10 AUGUST 1922                 6-15-1979
 CHILD'S BIRTHPLACE: PHOENIX MARICOPA AZ           6-15-1979
 CHILD'S DEATH DATE: N/D                           6-15-1979
 CHILD'S FIRST SPOUSE: HARRIET SMITH               6-15-1979

   MARRIAGE NUMBER 2
 SPOUSE: ALICE HOPE                                6-15-1979
 MARRIAGE DATE: 20 NOV 1932                        6-15-1979
 MARRIAGE PLACE: PHOENIX MARICOPA AZ               6-15-1979

   NUMBER OF CHILDREN BY THIS MARRIAGE 2

       * CHILDREN

          CHILD NUMBER: 1
 CHILD'S NAME: SAMUEL DOE  (M)                     6-15-1979
 == SAMUEL DOE IS A DIRECT ANCESTOR ==
 CHILD'S BIRTHDATE: 20 NOVEMBER 1934               6-15-1979
 CHILD'S BIRTHPLACE: PHOENIX MARICOPA AZ           6-15-1979
 CHILD'S DEATH DATE: N/D                           6-15-1979
 CHILD'S FIRST SPOUSE: SUSAN BLACK MILLER          6-15-1979
```

```
0140 PRINT TAB(8);"Since sequential disk files are used it is recom-"
0150 PRINT TAB(8);"mended that a maximum of 5 generations be recorded."
0160 PRINT :PRINT
0170 PRINT TAB(20);"For Tammi and Kirk"
0180 FOR X9=1 TO 100:NEXT X9
0190 GOSUB 530:PRINT:PRINT
0200 GOTO 230
0210 GOSUB 530:PRINT:PRINT TAB(4);"> Input error"
0220 PRINT
0230 PRINT TAB(19);"Please select an option: "
0240 PRINT
0250 PRINT TAB(30);"*":PRINT
0260 PRINT TAB(17);"Sequential File Index  [ 1 ]"
0270 PRINT TAB(19);"Create Individuals [ 2 ]"
0280 PRINT TAB(20);"Create Marriages [ 3 ]"
0290 PRINT TAB(19);"Create Child Files [ 4 ]"
0300 PRINT TAB(14);"Display Individual Information [ 5 ]"
0310 PRINT :PRINT TAB(19);"Update Individuals [ 6 ]"
0320 PRINT TAB (20);"Update Marriages [ 7 ]"
0330 PRINT TAB(20);"Update Children  [ 8 ]"
0340 PRINT TAB(13);"Correct Individual and Marriages [ 9 ]"
0350 PRINT TAB(16);"Correct Children's Files [ 10 ]"
0360 PRINT TAB(19);"Conclude Program  [ 11 ]"
0370 PRINT :PRINT
0380 PRINT TAB(5);"Your selection: ";
0390 INPUT X:GOSUB 530
0400 IF X=1 THEN CHAIN INDEX.BAS, 10: END
0410 IF X=2 THEN CHAIN INDIVID.BAS, 10: END
0420 IF X=3 THEN CHAIN MARRIAGE.BAS, 10: END
0430 IF X=4 THEN CHAIN CHILD.BAS, 10: END
0440 IF X=5 THEN CHAIN RECORD.BAS, 10: END
0450 IF X=6 THEN CHAIN UPINDIV.BAS, 10: END
0460 IF X=7 THEN CHAIN UPMARRG.BAS, 10: END
0470 IF X=8 THEN CHAIN UPCHILD.BAS, 10: END
0480 IF X=9 THEN CHAIN ALT.BAS, 10: END
0490 IF X=10 THEN CHAIN ALTCH.BAS, 10: END
0500 IF X=11 THEN END
0510 GOTO 210
0520 END
0530 REM ROUTINE TO CLEAR SCREEN
0540 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0550 RETURN
```

PROGRAM LISTING 2

```
0010 REM INDEX.BAS
0020 LINE= 120:Q=1:D9=28814:GOSUB 520
0030 DEF FNA(J)=LEN(STR$(INT(J)))
0040 PRINT :PRINT
0050 PRINT TAB(17);"INDEX BY INDIVIDUAL FILES"
0060 PRINT :PRINT
0070 PRINT TAB(8);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0080 INPUT X$
0090 IF X$="N" GOSUB 550
0100 IF X$="Y" GOSUB 620
0110 GOSUB 520:PRINT:PRINT
0120 PRINT
0130 PRINT TAB(8);"DO YOU WANT THE PRINTER, [ Y ] OR [ N ]";
0140 INPUT X$
0150 IF X$="Y" THEN Q=7
0160 OPEN #1, INDIV
0170 RESTORE
0180 LET I=I+1
0190 READ #1, G, A, M, C
0200 READ #1, D1, D2, D3
0210 READ #1, N$, S$, B$
0220 READ #1, P$, F$, M$
0230 READ #1, D$, E$, W$
0240 IF EOF(1)=1 THEN 460
0250 PRINT
0260 IF I=1 THEN GOSUB 520
0270 IF I>1 THEN GOTO 370
0280 REM INDEX FORMAT
```

```
        CHILD NUMBER: 2
CHILD'S NAME: PATRICA ANNE DOE  (F)              6-15-1979
CHILD'S BIRTHDATE: 4 APRIL 1935                  6-15-1979
CHILD'S BIRTHPLACE; PHOENIX MARICOPA AZ          6-15-1979
CHILD'S DEATH DATE: 20 JANUARY 1936              6-15-1979
CHILD'S FIRST SPOUSE: N/M                        6-15-1979

DEATH DATE: 10 NOV 1969                          6-15-1979
DEATH PLACE: PHOENIX MARICOPA AZ                 6-15-1979



              INDIVIDUAL GENEALOGICAL RECORDS

                        * * *


    THE RECORDS OF:  HELEN WHITE  (F)
    GENERATION: 3
    ANCESTOR NUMBER: 7
    DATE: JANUARY 1, 1980

   GENEALOGICAL INFORMATION                DATE RECORDED

BIRTHDATE: 4 APRIL 1903                          6-15-1979
BIRTHPLACE: PHOENIX MARICOPA AZ                  6-15-1979
FATHER: JAMES WHITE                              6-15-1979
MOTHER: SALLEY JAMES                             6-15-1979


      * MARRIAGE RECORDS
      NUMBER OF MARRIAGES: 1                     6-15-1979

  MARRIAGE NUMBER 1
SPOUSE: JOHN DOE                                 6-15-1979
MARRIAGE DATE: 14 JULY 1921                      6-15-1979
MARRIAGE PLACE: PHOENIX MARICOPA AZ              6-15-1979

  NUMBER OF CHILDREN BY THIS MARRIAGE 1

      * CHILDREN

        CHILD NUMBER: 1
CHILD'S NAME: JAMES DOE  (M)                     6-15-1979
CHILD'S BIRTHDATE: 10 AUGUST 1922                6-15-1979
CHILD'S BIRTHPLACE: PHOENIX MARICOPA AZ          6-15-1979
CHILD'S DEATH DATE: N/D                          6-15-1979
CHILD'S FIRST SPOUSE: HARRIET SMITH              6-15-1979

DEATH DATE: N/D                                  6-15-1979
DEATH PLACE: N/D                                 6-15-1979
```

PROGRAM LISTING 1

```
0010 REM MAIN.BAS
0020 LINE= 120:GOSUB 530:PRINT:PRINT
0030 PRINT TAB(24);"MICRO/ROOTS"
0040 PRINT TAB(20);"GENEALOGICAL SYSTEM"
0050 REM COPYRIGHT (c) 1979 BY JIM SCHREIER
0060 PRINT
0070 PRINT TAB(22);"By Jim Schreier"
0080 PRINT :FORX9=1TO15:PRINTTAB(22);"*";:NEXTX9:PRINT
0090 FOR X9=1TO100:NEXT X9
0100 GOSUB 530:PRINT:PRINT
0110 PRINT TAB(10);"This Genealogical System is designed to operate"
0120 PRINT TAB(8);"with SWTPC 6800 disk BASIC v 3.0 using the mini-"
0130 PRINT TAB(8);"FLEXtm DOS by Technical Systems Consultants, Inc."
0290 LET X6=X6+1900
0300 PRINT #Q,TAB(17);"INDEX BY INDIVIDUAL"
0310 PRINT #Q,TAB(20);Z$;" ";X5;:PRINT#Q,CHR$(8);
0320 PRINT #Q,", ";X6
0330 PRINT #Q:PRINT #Q
0340 PRINT #Q,"ENTRY";TAB(8);"INDIVIDUAL";
0350 PRINT #Q,TAB(28);"GENERATION";TAB(40);"ANCESTOR";
0360 PRINT #Q,TAB(51);"BIRTHDATE"
0370 PRINT #Q,TAB(3-FNA(I));I;
0380 PRINT #Q,TAB(5);N$;" (";S$;") ";
0390 PRINT #Q,TAB(34-FNA(G));G;
0400 PRINT #Q,TAB(44-FNA(A));A;
0410 PRINT #Q,TAB(50);B$
0420 PRINT #Q,TAB(13);"ENTRY NUMBER ";I;"RECORDED: ";
0430 PRINT #Q,D1;:PRINT#Q,CHR$(8);"-";D2;:PRINT#Q,CHR$(8);"-";D3
0440 PRINT #Q
0450 GOTO 180
0460 REM END OF READOUT
0470 CLOSE #1
0480 PRINT :PRINT
0490 INPUT "DO YOU WISH TO REPEAT THIS SEQUENCE, [ Y ] OR [ N ]",X$
0500 IF X$<>"Y" THEN CHAIN MAIN, 180: END
0510 IF X$="Y" THEN I=0:X6=X6-1900:GOTO 110
0520 REM ROUTINE TO CLEAR SCREEN
0530 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0540 RETURN
0550 REM DATE ROUTINE COMPATIABLE WITH TSC MINIFLEX(tm)
0560 PRINT :PRINT
0570 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
0580 PRINT :PRINT
0590 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
0600 GOSUB 620:GOSUB 520
0610 RETURN
0620 REM ROUTINE TO RECOVER DATE
0630 LET X4=PEEK(D9):X5=PEEK(D9+1):X6=PEEK(D9+2)
0640 FOR X9=1 TO X4:READ Z$:NEXT X9
0650 DATA "JANUARY","FEBRUARY","MARCH","APRIL","MAY","JUNE"
0660 DATA "JULY","AUGUST","SEPTEMBER","OCTOBER","NOVEMBER"
0670 DATA "DECEMBER"
0680 RETURN
```

PROGRAM LISTING 3

```
0010 REM INDIVID.BAS
0020 LINE= 120:D9=28814:GOSUB 610
0030 PRINT :PRINT
0040 PRINT TAB(16);"INDIVIDUAL FILE CREATION"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" GOSUB 640
0090 OPEN #1, INDIV
0100 PRINT :PRINTTAB(12);"TO STOP ENTER 'STOP' IN RESPONSE"
0110 PRINT TAB(17);"TO NAME OR HIT RETURN."
0120 PRINT :PRINT
0130 INPUT "NAME: ",N$
0140 IF N$="" THEN CLOSE #1:CHAIN MAIN, 180: END
0150 IF N$="STOP" THEN CLOSE #1:CHAIN MAIN, 180: END
0160 INPUT "SEX: [ M ] OR [ F ] ",S$
0170 IF S$="M" THEN S=0:GOTO 210
0180 IF S$="F" THEN S=1:GOTO 210
0190 PRINT :PRINTTAB(10);"> INPUT ERROR":PRINT
0200 GOTO 160
0210 INPUT "DATE OF BIRTH: ",B$
0220 INPUT "GENERATION: ",G
0230 INPUT "ANCESTOR NUMBER: ",A
0240 IF G<=1 THEN 420: REM IF ZERO ANCESTOR COLLERATAL
0250 REM CHECK FOR VALID NUMBERS
0260 IF A/2<>INT(A/2) THEN 310
0270 IF S=0 THEN 340
0280 PRINT
0290 PRINT TAB(10);"> FEMALE ANCESTOR NUMBERS MUST BE ODD"
0300 PRINT :GOTO 230
```

```
0310 IF S=1 THEN 340
0320 PRINT :PRINTTAB(10);"> MALE ANCESTOR NUMBERS MUST BE EVEN"
0330 PRINT :GOTO 230
0340 LET X1=INT(2^(G-1)+.1)
0350 IF A>=X1 THEN 370
0360 GOTO 390
0370 LET X2=INT((2^G)+.1)-1
0380 IF A<=X2 THEN 430
0390 PRINT
0400 PRINT TAB(10);"> GENERATION/ANCESTOR NUMBERS UNCORRELATED"
0410 PRINT :GOTO 220
0420 IF A>1 THEN 390
0430 REM CONTINUE INPUT
0440 INPUT "BIRTHPLACE: ",P$
0450 INPUT "FATHER: ",F$
0460 INPUT "MOTHER: ",M$
0470 INPUT "DEATH DATE: ",D$
0480 INPUT "DEATH PLACE: ",E$
0490 INPUT "ENTER NUMBER OF MARRIAGES: ",M
0500 INPUT "FIRST SPOUSE: ",W$
0510 INPUT "NUMBER OF CHILDREN, FIRST MARRIAGE: ",C
0520 GOSUB 710
0530 REM WRITE TO DISK
0540 WRITE #1, G, A, M, C
0550 WRITE #1, Y7, Y8, Y9
0560 WRITE #1, N$, S$, B$
0570 WRITE #1, P$, F$, M$
0580 WRITE #1, D$, E$, W$
0590 GOTO 120
0600 END
0610 REM ROUTINE TO CLEAR SCREEN
0620 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0630 RETURN
0640 REM DATE ROUTINE
0650 PRINT :PRINT
0660 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
0670 PRINT :PRINT
0680 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
0690 GOSUB 610
0700 RETURN
0710 REM ROUTINE TO RECOVER DATE
0720 LET Y7=PEEK(D9):Y8=PEEK(D9+1):Y9=PEEK(D9+2)
0730 GOSUB 610
0740 RETURN
```

PROGRAM LISTING 4

```
0010 REM MARRIAGE.BAS
0020 LINE= 120:D9=28814:GOSUB 540
0030 PRINT :PRINT
0040 PRINT TAB(16);"MARRIAGE RECORD CREATION"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" GOSUB 570
0085 GOSUB 540:PRINT:PRINT
0090 OPEN #1, INDIV
0100 PRINT :PRINT
0110 INPUT "ENTER THE INDIVIDUAL'S NAME: ",C$
0120 IF C$="" THEN CLOSE #1:CHAIN MAIN, 180: END
0130 IF C$="STOP" THEN CLOSE #1:CHAIN MAIN, 180: END
0140 RESTORE #1
0150 READ #1, G, A, M, C
0160 READ #1, D1, D2, D3
0170 READ #1, N$, S$, B$
0180 READ #1, P$, F$, M$
0190 READ #1, D$, E$, W$
0200 IF EOF(1)<>0 THEN 480:REM ENTRY NOT FOUND
0210 IF N$<>C$ THEN 150
0220 REM ENTRY FOUND
0230 CLOSE #1
0240 PRINT :PRINT
0250 IF M=0 THEN CLOSE #1:GOTO 670
0260 OPEN #2, MARR
0290 IF B$<>W$ THEN 190
0300 REM NO MATCH
0310 GOTO 710
0320 REM PROPER HUSBAND/WIFE LOCATED
0330 CLOSE #2
0340 PRINT :PRINT
0350 IF C=0 THEN CLOSE #2:GOTO 920
0360 GOSUB 800:PRINT:PRINT
0370 PRINT TAB(10);"INDIVIDUAL";TAB(40);"SPOUSE"
0380 PRINT TAB(10);N$;TAB(40);W$
0390 PRINT :PRINT
0400 PRINT TAB(10);"CHILDREN: ";C
0410 PRINT TAB(10);"MARRIAGE NUMBER ";I;"FOR ";N$
0420 PRINT :PRINT
0430 LET J=J+1
0440 PRINT :PRINT TAB(5);"CHILD NUMBER ";J
0450 INPUT "CHILD'S NAME: ",M$
0460 IF M$="" THEN CLOSE #3:CHAIN MAIN, 180: END
0470 IF M$="STOP" THEN CLOSE $3:CHAIN MAIN, 180: END
0480 INPUT "CHILD'S SEX: ",O$
0490 PRINT "IS ";M$; " DIRECT ANCESTOR, [ Y ] OR [ N ]";
0500 INPUT X$
0510 IF X$="Y" THEN A1=10
0520 IF X$="N" THEN A1=0
0530 INPUT "CHILD'S BIRTHDATE: ",P$
0540 INPUT "CHILD'S BIRTHPLACE: ",Q$
0550 INPUT "CHILD'S DEATH DATE: ",U$
0560 INPUT "CHILD'S FIRST SPOUSE: ",V$
0570 GOSUB 900
0580 REM WRITE TO DISK
0590 WRITE #3, N$, W$, I, C
0600 WRITE #3, Y7, Y8, Y9
0610 WRITE #3, J, M$, O$
0620 WRITE #3, A1, P$, Q$
0630 WRITE #3, U$, V$
0640 IF C<>J THEN 430
0650 IF J=C THEN GOTO 660
0660 PRINT
0670 PRINT "CREATE ADDITIONAL CHILDREN'S FILES, "
0680 INPUT "[ Y ] OR [ N ] ",L$
0690 IF L$="Y" THEN J=0:GOTO 110
0700 CLOSE #3:GOTO 780
0710 REM ENTRY NOT FOUND
0720 CLOSE #2
0730 PRINT TAB(10);"THE INDIVIDUAL AND/OR SPOUSE,"
0740 PRINT TAB(10);A$;" AND"
0750 PRINT TAB(10);B$;" DOES"
0760 PRINT TAB(10);"NOT MATCH A PREVIOUSLY CREATED"
0770 PRINT TAB(10);"MARRIAGE FILE."
0780 CHAIN MAIN, 180
0790 END
0800 REM ROUTINE TO CLEAR SCREEN
0810 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0820 RETURN
0830 REM DATE ROUTINE
0840 PRINT :PRINT
0850 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
0860 PRINT :PRINT
0870 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
0880 GOSUB 800
0890 RETURN
0900 REM ROUTINE TO RECOVER DATE
0905 LET Y7=PEEK(D9):Y8=PEEK(D9+1):Y9=PEEK(D9+2)
0910 RETURN
0920 PRINT TAB(10);"THE MARRIAGE FILE INDICIATES THAT"
0930 PRINT TAB(10);"THERE WERE NO CHILDREN FROM THIS MARRIAGE."
0940 CHAIN MAIN, 180: END
```

PROGRAM LISTING 6

```
0010 REM RECORD.BAS
0020 LINE= 120:Q=1:D9=28814:GOSUB 1300
0030 PRINT :PRINT
0040 PRINT TAB(14);"INDIVIDUAL GENEALOGY RECORDS"
0050 PRINT :PRINT
```

```
0270 LET I=I+1
0280 PRINT :PRINT TAB(8);"MARRIAGE NUMBER ";I;":  ";N$
0290 PRINT
0300 INPUT "SPOUSE: ",W$
0310 IF W$="" THEN CLOSE #2:END
0320 IF W$="STOP" THEN CLOSE #2:END
0330 INPUT "MARRIAGE DATE: ",R$
0340 INPUT "MARRIAGE PLACE: ",T$
0350 INPUT "NUMBER OF CHILDREN: ",C
0360 GOSUB 630
0370 REM WRITE TO DISK
0380 WRITE #2, N$, G, A
0390 WRITE #2, Y7, Y8, Y9
0400 WRITE #2, I, C, S$
0410 WRITE #2, W$, R$, T$
0420 IF M<>I THEN 270
0430 CLOSE #2
0440 PRINT :PRINT
0450 INPUT "ADDITIONAL MARRIAGES, [ Y ] OR [ N ]",L$
0460 IF L$="Y" THEN I=0:GOTO 85
0470 CHAIN MAIN, 180: END
0480 PRINT :PRINT
0490 PRINT TAB(10);"THE INDIVIDUAL SELECTED, ";C$;", DOES"
0500 PRINT TAB(10);"NOT MATCH A PREVIOUSLY CREATED INDIVIDUAL"
0510 PRINT TAB(10);"FILE. PLEASE REVIEW THE INDEX."
0520 CLOSE #1:CHAIN MAIN, 180
0530 END
0540 REM ROUTINE TO CLEAR SCREEN
0550 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0560 RETURN
0570 REM DATE ROUTINE
0580 PRINT :PRINT
0590 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
0600 PRINT :PRINT
0610 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
0620 GOSUB 630:GOSUB 540
0630 REM ROUTINE TO RECOVER DATE
0640 LET Y7=PEEK(D9):Y8=PEEK(D9+1):Y9=PEEK(D9+2)
0650 RETURN
0660 REM NOT MARRIED ERROR MESSAGE
0670 PRINT TAB(10);"THE INDIVIDUAL FILE INDICIATES THAT"
0680 PRINT TAB(10);N$;" IS NOT MARRIED."
0690 CHAIN MAIN, 180
0700 END
```

PROGRAM LISTING 5

```
0010 REM CHILD.BAS
0020 LINE= 120:J=0:D9=28814:GOSUB 800
0030 PRINT :PRINT
0040 PRINT TAB(19);"CHILDREN FILE CREATION"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 GOSUB 800:PRINT:PRINT
0090 IF X$="N" GOSUB 830
0100 OPEN #3, CHILDREN.DAT
0110 OPEN #2, MARR
0120 PRINT
0130 INPUT "ENTER INDIVIDUAL: ",A$
0140 INPUT "ENTER SPOUSE: ",B$
0150 IF A$="" THEN CLOSE #2:CHAIN MAIN, 180: END
0160 IF A$="STOP" THEN CLOSE #2:CHAIN MAIN, 180: END
0170 IF B$="" THEN CLOSE #2:CHAIN MAIN, 180: END
0180 IF B$="STOP" THEN CLOSE #2:CHAIN MAIN, 180: END
0190 READ #2, N$, G, A
0200 READ #2, D1, D2, D3
0210 READ #2, I, C, S$
0220 READ #2, W$, R$, T$
0230 IF EOF(2)<>0 THEN GOTO 710
0240 REM MATCH INDIVIDUAL
0250 IF A$=N$ THEN 270
0260 IF A$<>N$ THEN 190
0270 REM MATCH SPOUSE
0280 IF B$=W$ THEN 320
```

```
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" GOSUB 1330
0090 IF X$="Y" GOSUB 1400
0100 GOSUB 1300:PRINT:PRINT
0110 PRINT TAB(5);"DO YOU WANT THE PRINTER, [ Y ] OR [ N ]";
0120 INPUT X$
0130 IF X$="Y" THEN Q=7
0140 OPEN #1, INDIV
0150 PRINT :PRINT
0160 INPUT "NAME OF THE INDIVIDUAL",C$
0170 IF C$="" THEN CLOSE #1:END
0180 IF C$="STOP" THEN CLOSE #1:END
0190 RESTORE #1
0200 READ #1, G, A, M, C
0210 READ #1, D1, D2, D3
0220 READ #1, N$, S$, B$
0230 READ #1, P$, F$, M$
0240 READ #1, D$, E$, W$
0250 IF EOF(1)<>0 THEN CLOSE #1:GOTO 1290:REM ENTRY NOT FOUND
0260 IF C$<>N$ THEN 200
0270 REM ENTRY FOUND
0280 CLOSE #1
0290 PRINT :PRINT
0300 LET X3=X3+1900
0310 GOSUB 1300
0320 PRINT #Q,TAB(16);"INDIVIDUAL GENEALOGICAL RECORDS"
0330 PRINT #Q:PRINT #Q,TAB(28);"* * *"
0340 GOSUB 1470
0350 PRINT #Q:PRINT #Q
0360 PRINT #Q,TAB(5);"THE RECORDS OF:  ";N$;"  (";S$;")"
0370 PRINT #Q,TAB(5);"GENERATION: ";G
0380 IF A=0 PRINT #Q,TAB(5);"ANCESTOR: COLLATERAL":GOTO 400
0390 PRINT #Q,TAB(5);"ANCESTOR NUMBER: ";A
0400 PRINT #Q,TAB(5);"DATE: ";Z$;" ";X2;:PRINT#Q,CHR$(8);
0410 PRINT #Q,", ";X3:PRINT #Q
0420 PRINT #Q,TAB(4);"GENEALOGICAL INFORMATION";
0430 PRINT #Q,TAB(45);"DATE RECORDED"
0440 PRINT #Q
0450 PRINT #Q,"BIRTHDATE: ";B$;TAB(49);L$
0460 PRINT #Q,"BIRTHPLACE: ";P$;TAB(49);L$
0470 PRINT #Q,"FATHER: ";F$;TAB(49);L$
0480 PRINT #Q,"MOTHER: ";M$;TAB(49);L$
0490 PRINT #Q
0500 IF M=0 THEN PRINT #Q,"NO MARRIAGE RECORDS":GOTO 680
0510 PRINT #Q:PRINT #Q,TAB(7);"* MARRIAGE RECORDS"
0520 PRINT #Q,TAB(7);"NUMBER OF MARRIAGES: ";M;TAB(49);L$
0530 PRINT #Q
0540 OPEN #2, MARR
0550 RESTORE #2
0560 LET E=E+1
0570 PRINT #Q,TAB(3);"MARRIAGE NUMBER ";E
0580 READ #2, N$, G, A
0590 READ #2, D1, D2, D3
0600 READ #2, I, C, S$
0610 READ #2, W$, R$, T$
0620 IF EOF(2)<>0 THEN CLOSE #2:GOTO 1130
0630 IF N$<>C$ THEN 580
0640 GOSUB 1470
0650 REM ENTRY FOUND
0660 PRINT #Q,"SPOUSE: ";W$;TAB(49);L$
0670 PRINT #Q,"MARRIAGE DATE: ";R$;TAB(49);L$
0680 PRINT #Q,"MARRIAGE PLACE: ";T$;TAB(49);L$
0690 IF E<I THEN 710
0700 IF E=I THEN CLOSE #2:GOTO 710
0710 REM CHECK FOR CHILDREN
0720 IF C=0 THEN 760
0730 PRINT #Q
0740 PRINT #Q,TAB(3);"NUMBER OF CHILDREN BY THIS MARRIAGE ";C
0750 GOTO 810
0760 REM NO CHILDREN
0770 PRINT #Q
0780 PRINT #Q,TAB(5);"NO CHILDREN BY THIS MARRIAGE"
0790 IF E=I THEN 1090
0800 IF E<>I THEN 560
```

```
0810 REM READ CHILDREN'S FILES
0820 PRINT #Q
0830 PRINT #Q,TAB(5);"* CHILDREN"
0840 PRINT #Q
0850 OPEN #3, CHILDREN
0860 LET K=K+1
0870 READ #3, N$, W$, I, C
0880 READ #3, D1, D2, D3
0890 READ #3, J, M$, O$
0900 READ #3, A1, P$, Q$
0910 READ #3, U$, V$
0920 IF EOF(3)<>0 THEN CLOSE #3:PRINT #Q,"ENTRY NOT FOUND":END
0930 GOSUB 1470
0940 REM INDIVIDUAL MATCHED
0950 IF C$=N$ THEN 990
0960 IF C$=W$ THEN 990
0970 IF C$<>N$ THEN 870
0980 IF C$<>W$ THEN 870
0990 PRINT #Q,TAB(10);"CHILD NUMBER: ";J
1000 PRINT #Q,"CHILD'S NAME: ";M$;TAB(49);L$
1010 IF A1=10 THEN PRINT #Q,"== ";M$;" IS A DIRECT ANCESTOR =="
1020 PRINT #Q,"CHILD'S BIRTHDATE: ";P$;TAB(49);L$
1030 PRINT #Q,"CHILD'S BIRTHPLACE: ";Q$;TAB(49);L$
1040 PRINT #Q,"CHILD'S DEATH DATE: ";U$;TAB(49);L$
1050 PRINT #Q,"CHILD'S FIRST SPOUSE: ";V$;TAB(49);L$
1060 PRINT #Q
1070 IF K<>C THEN 860
1080 IF K=C THEN 70
1090 GOTO 1130
1100 PRINT #Q,"THE NAME, ";N$;" DOES NOT APPEAR IN THE"
1110 PRINT #Q,"MARRIAGE FILES. PLEASE CHECK           "
1120 PRINT #Q,"INDEX TO VERIFY FILE CONTENTS.":END
1130 REM DEATH DATA
1140 OPEN #1, INDIV
1150 READ #1, G, A, M, C
1160 READ #1, D1, D2, D3
1170 READ #1, N$, S$, B$
1180 READ #1, P$, F$, M$
1190 READ #1, D$, E$, W$
1200 IF EOF(1)<>0 THEN CLOSE #1:GOTO 1270
1210 IF C$<>N$ THEN 1150
1220 IF C$=N$ THEN 1230
1230 CLOSE #1
1240 GOSUB 1470
1250 PRINT #Q,"DEATH DATE: ";D$;TAB(49);L$
1260 PRINT #Q,"DEATH PLACE: ";E$;TAB(49);L$
1270 CHAIN MAIN, 180: END
1280 PRINT "ENTRY NOT FOUND":END
1290 END
1300 REM ROUTINE TO CLEAR SCREEN
1310 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
1320 RETURN
1330 REM DATE ROUTINE
1340 PRINT :PRINT
1350 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
1360 PRINT :PRINT
1370 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
1380 GOSUB 1400:GOSUB 1300
1390 RETURN
1400 REM RECOVER DATE ROUTINE
1410 LET X1=PEEK(D9X2=PEEK(D9+1):X3=PEEK(D9+2)
1420 FOR X9=1 TO X1:READ Z$:NEXT X9
1430 DATA "JANUARY","FEBRUARY","MARCH","APRIL"
1440 DATA "MAY","JUNE","JULY","AUGUST","SEPTEMBER"
1450 DATA "OCTOBER","NOVEMBER","DECEMBER"
1460 RETURN
1470 LET G$="-":A$=STR$(D1)+G$
1480 LET X$=STR$(D2):Y$=STR$(D3)
1490 LET L$=A$+X$+G$+Y$
1500 RETURN
```

PROGRAM LISTING 7

```
0760 INPUT "FATHER ",F$
070 INPUT "MOTHER ",M$
0780 INPUT "DEATH DATE ",D$
0790 INPUT "DEATH PLACE ",E$
0800 INPUT "ENTER NUMBER OF MARRIAGES ",M
0810 INPUT "FIRST SPOUSE ",$
0820 INPUT "NUMBER OF CHILDREN, FIRST MARRIAGE ",C
0830 REM WRITE TO DISK
0840 WRITE #5, G, A, M, C
0850 WRITE #5, X1, X2, X3
0860 WRITE #5, N$, S$, B$
0870 WRITE #5, P$, F$, M$
0880 WRITE #5, D$, E$, W
0890 GOTO 430
0900 PRINT :REM DELETE AND RENAME FILE
0910 KILL INDIV
0920 RENAME TEMP.INV INDIV
0930 PRINT TAB(5);"MORE ENTRIES, [ Y ] OR [ N ]";
0940 INPUT X$
0950 IF X$="Y" THEN 220
0960 CHAIN MAIN, 180
0970 END
0980 REM ROUTINE TO CLEAR SCREEN
0990 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
1000 RETURN
1010 REM DATE ROUTINE
1020 PRINT :PRINT
1030 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
1040 PRINT :PRINT
1050 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
1060 GOSUB 980:GOSUB 1080
1070 RETURN
1080 REM DATE RECOVER ROUTINE
1090 LET X1=PEEK(D9):X2=PEEK(D9+1):X3=PEEK(D9+2)
1100 RETURN
```

PROGRAM LISTING 8

```
0010 REM UPMARRG.BAS
0020 LINE= 120:D9=28814:GOSUB 580
0030 PRINT :PRINT
0040 PRINT TAB(19);"MARRIAGE FILES UPDATE"
0050 PRINT :PRINT
0060 PRINT TAB(10);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" GOSUB 610
0090 IF X$="Y" GOSUB 680
0100 GOSUB 580
0110 PRINT :PRINT
0120 OPEN #2, MARR
0130 OPEN #6, TEMPMAR
0140 SCRATCH #6
0150 PRINT TAB(12);"THIS PROGRAM SHOULD BE USED TO ADD"
0160 PRINT TAB(12);"MARRIAGE RECORDS TO THE CURRENT"
0170 PRINT TAB(12);"MARRIAGE FILES."
0180 READ #2, N$, G, A
0190 READ #2, D1, D2, D3
0200 READ #2, I, C, S$
0210 READ #2, W$, R$, T$
0220 IF EOF(2)<>0 THEN 280
0230 WRITE #6, N$, G, A
0240 WRITE #6, D1, D2, D3
0250 WRITE #6, I, C, S$
0260 WRITE #6, W$, R$, T$
0270 GOTO 180
0280 PRINT :PRINT
0290 PRINT TAB(5);" WHEN ALL MARRIAGES HAVE BEEN ENTERED FOR"
0300 PRINT TAB(5);"THE INDIVIDUAL ENTER THE WORD 'STOP' OR"
0310 PRINT TAB(5);"HIT RETURN IN RESPONSE TO THE NAME."
0320 PRINT :PRINT
0330 INPUT "ENTER INDIVIDUAL'S NAME: ",N$
0340 IF N$="" THEN CLOSE #2, #6:GOTO 490
0350 IF N$="STOP" THEN CLOSE #2, #6:GOTO 490
0360 LET I=(I+1)-1
0370 PRINT TAB(9);"MARRIAGE NUMBER ";I;": ";N$
```

```
0010 REM UPINDIV.BAS
0020 LINE= 120:D9=28814:GOSUB 980
0030 PRINT :PRINT
0040 PRINT TAB(18);"INDIVIDUAL FILES UPDATE"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" GOSUB 1010
0090 IF X$="Y" GOSUB 1080
0100 GOSUB 980:PRINT:PRINT
0110 PRINT TAB(10);"THIS PROGRAM SHOULD BE USED TO ADD AN"
0120 PRINT TAB(10);"INDIVIDUAL'S NEW RECORDS TO THE INDIV-"
0130 PRINT TAB(10);"IDUAL RECORDS. IF YOU HAVE A QUESTION"
0140 PRINT TAB(10);"YOU MAY WISH TO VERIFY THE INDIVIDUALS"
0150 PRINT TAB(10);"CONTAINED IN THE FILES BY RUNNING THE"
0160 PRINT TAB(21);"THE INDEX FILE."
0170 PRINT :PRINT
0180 PRINT TAB(10);"DO YOU WANT THE SEQUENTIAL INDEX"
0190 PRINT TAB(14);"PROGRAM, [ Y ] OR [ N ]";
0200 INPUT X$
0210 IF X$="Y" THEN CHAIN INDEX, 10:END
0220 GOSUB 980
0230 PRINT :PRINT
0240 REM OPEN FILES
0250 OPEN #1, INDIV
0260 OPEN #5, TEMP.INV
0270 SCRATCH #5
0280 READ #1, G, A, M, C
0290 READ #1, D1, D2, D3
0300 READ #1, N$, S$, B$
0310 READ #1, P$, F$, M$
0320 READ #1, D$, E$, W$
0330 IF EOF(1)<>0 THEN 400
0340 WRITE #5, G, A, M, C
0350 WRITE #5, D1, D2, D3
0360 WRITE #5, N$, S$, B$
0370 WRITE #5, P$, F$, M$
0380 WRITE #5, D$, E$, W$
0390 GOTO 280
0400 PRINT :PRINT
0410 PRINT TAB(5);"TO CONCLUDE ENTRY OF NEW FILES RESPOND WITH"
0420 PRINT TAB(5);"A RETURN OR ENTER THE WORD, 'STOP'."
0430 PRINT :PRINT
0440 INPUT "NAME: ",N$
0450 IF N$="" THEN CLOSE #1, #5:GOTO 900
0460 IF N$="STOP" THEN CLOSE #1, #5:GOTO 900
0470 INPUT "SEX: ",S$
0480 IF S$="M" THEN S=0:GOTO 520
0490 IF S$="F" THEN S=1:GOTO 520
0500 PRINT :PRINTTAB(10);"> INPUT ERROR":PRINT
0510 GOTO 470
0520 INPUT "BIRTH DATE: ",B$
0530 INPUT "GENERATION: ",G
0540 INPUT "ANCESTOR NUMBER: ",A
0550 IF G<=1 THEN 730:REM IF ZERO ANCESTOR COLLATERAL
0560 REM CHECK FOR VALID NUMBERS
0570 IF A/2<>INT(A/2) THEN 620
0580 IF S=0 THEN 650
0590 PRINT
0600 PRINT TAB(10);"> FEMALE ANCESTOR NUMBERS MUST BE ODD"
0610 PRINT :GOTO 540
0620 IF S=1 THEN 650
0630 PRINT :PRINTTAB(10);"> MALE ANCESTOR NUMBERS MUST BE EVEN"
0640 PRINT :GOTO 540
0650 LET X6=INT(2^(G-1)+.1)
0660 IF A>=X6 THEN 680
0670 GOTO 700
0680 LET X7=INT((2^G)+1)-1
0690 IF A<=X7 THEN 740
0700 PRINT
0710 PRINT TAB(10);"> GENERATION/ANCESTOR NUMBERS UNCORRELATED"
0720 PRINT :GOTO 530
0730 IF A>1 THEN 700
0740 REM CONTINUE INPUT
0750 INPUT "BIRTHPLACE ",P$
0380 PRINT
0390 INPUT "SPOUSE: ",W$
0400 INPUT "MARRIAGE DATE: ",R$
0410 INPUT "MARRIAGE PLACE: ",T$
0420 INPUT "NUMBER OF CHILDREN: ",C
0430 REM WRITE NEW DATA TO DISK
0440 WRITE #6, N$, G, A
0450 WRITE #6, X1, X2, X3
0460 WRITE #6, I, C, S$
0470 WRITE #6, W$, R$, T$
0480 GOTO 320
0490 REM DELETE AND RENAME FILE
0500 KILL MARR
0510 RENAME TEMPMAR MARR
0520 PRINT TAB(5);"MORE ENTRIES FOR ANOTHER INDIVIDUAL,"
0530 PRINT TAB(17);"[ Y ] OR [ N ]";
0540 INPUT X$
0550 IF X$="Y" THEN I=0:GOTO 100
0560 CHAIN MAIN, 180
0570 END
0580 REM ROUTINE TO CLEAR SCREEN
0590 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0600 RETURN
0610 REM DATE ROUTINE
0620 PRINT :PRINT
0630 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
0640 PRINT :PRINT
0650 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
0660 GOSUB 680:GOSUB 580
0670 RETURN
0680 REM DATE RECOVERY ROUTINE
0690 LET X1=PEEK(D9):X2=PEEK(D9+1):X3=PEEK(D9+2)
0700 RETURN
```

PROGRAM LISTING 9

```
0010 REM UPCHILD.BAS
0020 LINE= 120:D9=28814:GOSUB 850
0030 PRINT :PRINT
0040 PRINT TAB(20);"CHILDREN'S FILES UPDATE"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [  Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" GOSUB 880
0090 IF X$="Y" GOSUB 950
0100 GOSUB 850
0110 PRINT :PRINT
0120 OPEN #3, CHILDREN
0130 OPEN #7, TEMPC
0140 SCRATCH #7
0150 PRINT TAB(12);"THIS PROGRAM SHOULD BE USED TO ADD THE"
0160 PRINT TAB(12);"CHILDREN'S RECORDS TO THE CURRENT CHILD"
0170 PRINT TAB(12);"FILES."
0180 READ #3, N$, W$, I, C
0190 READ #3, D1, D2, D3
0200 READ #3, J, M$, O$
0210 READ #3, A1, P$, Q$
0220 READ #3, U$, V$
0230 IF EOF(3)<>0 THEN 300
0240 WRITE #7, N$, W$, I, C
0250 WRITE #7, D1, D2, D3
0260 WRITE #7, J, M$, O$
0270 WRITE #7, A1, P$, Q$
0280 WRITE #7, U$, V$
0290 GOTO 180
0300 PRINT :PRINT
0310 PRINT TAB(5);"WHEN ALL CHILDREN HAVE BEEN ENTERED FOR THE"
0320 PRINT TAB(5);"INDIVIDUAL AND SPOUSE ENTER THE WORD 'STOP'"
0330 PRINT TAB(5);"OR HIT RETURN IN RESPONSE TO THE INDIVIDUAL."
0340 PRINT :PRINT
0350 INPUT "HIT [ RETURN ] TO CONTINUE",X$
0360 GOSUB 850:PRINT:PRINT
0370 INPUT "ENTER THE INDIVIDUAL'S NAME: ",N$
0380 INPUT "ENTER SPOUSE'S NAME: ",W$
0390 IF N$="" THEN CLOSE #3, #7: GOTO 760
0400 IF N$="STOP" THEN CLOSE #3, #7: GOTO 760
```

```
0410 IF W$="" THEN CLOSE #3, #7: GOTO 760
0420 IF W$="STOP" THEN CLOSE #3, #7:GOTO 760
0430 PRINT
0440 PRINT "MARRIAGE NUMBER FOR ";N$:INPUT I
0450 INPUT "NUMBER OF CHILDREN, THIS MARRIAGE: ",C
0460 IF C=0 THEN CLOSE #3, #7: GOTO 760
0470 GOSUB 850:PRINT:PRINT
0480 PRINT TAB(10);"INDIVIDUAL";TAB(40);"SPOUSE"
0490 PRINT TAB(8);N$;TAB(38);W$
0500 PRINT
0510 PRINT TAB(10);"CHILDREN: ";C
0520 PRINT TAB(10);"MARRIAGE NUMBER ";I;" FOR ";N$
0530 PRINT :PRINT
0540  J=J+1
0550 PRINT TAB(5);"CHILD NUMBER ";J
0560 PRINT
0570 INPUT "CHILD'S NAME: ",M$
0580 IF M$="" THEN CLOSE #3, #7: GOTO 760
0590 IF M$="STOP" THEN CLOSE #3, #7: GOTO 760
0600 INPUT "CHILD'S SEX: ",O$
0610 INPUT "IS CHILD A DIRECT ANCESTOR, [ Y ] OR [ N ]",X$
0620 IF X$="Y" THEN A1=10
0630 IF X$="N" THEN A1=0
0640 INPUT "CHILD'S BIRTHDATE: ",P$
0650 INPUT "CHILD'S BIRTHPLACE: ",Q$
0660 INPUT "CHILD'S DEATH DATE: ",U$
0670 INPUT "CHILD'S FIRST SPOUSE: ",V$
0680 REM WRITE NEW INFORMATION TO DISK
0690 WRITE #7, N$, W$, I, C
0700 WRITE #7, X4, X5, X6
0710 WRITE #7, J, M$, O$
0720 WRITE #7, A1, P$, Q$
0730 WRITE #7, U$, V$
0740 IF J<>C THEN GOTO 470
0750 IF J=C THEN J=0:GOTO 300
0760 REM DELETE AND RENAME FILE
0770 KILL CHILDREN
0780 RENAME TEMPC CHILDREN
0790 PRINT TAB(5);"MORE ENTRIES FOR ANOTHER INDIVIDUAL AND"
0800 PRINT TAB(15);"SPOUSE, [ Y ] OR [ NO ] ";
0810 INPUT X$
0820 IF X$="Y" THEN J=0:GOTO 300
0830 CHAIN MAIN, 180
0840 END
0850 REM ROUTINE TO CLEAR SCREEN
0860 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
0870 RETURN
0880 REM DATE ROUTINE
0890 PRINT :PRINT
0900 INPUT "ENTER DATE AS MM,DD,YY ",D1,D2,D3
0910 PRINT :PRINT
0920 POKE( D9,D1):POKE(D9+1,D2):POKE(D9+2,D3)
0930 GOSUB 950:GOSUB 850
0940 RETURN
0950 REM ROUTINE TO RECOVER DATE
0960 LET X4=PEEK(D9):X5=PEEK(D9+1):X6=PEEK(D9+2)
0970 RETURN
```

PROGRAM LISTING 10

```
0010 REM ALT.BAS
0020 LINE= 120:J=0:L1=:D9=28814:GOSUB 1650
0030 PRINT :PRINT
0040 PRINT TAB(21);"FILE ALTERATION"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" THEN GOSUB 1680
0090 IF X$="Y" THEN GOSUB 1750
0100 GOSUB 1650:PRINT:PRINT
0110 PRINT TAB(10);"THIS PROGRAM WILL CORRECT INPUT ERRORS IN"
0120 PRINT TAB(10);"THE DISK FILES OR ALLOW INFORMATION CONT-"
0130 PRINT TAB(10);"AINED IN THE FILES TO BE BROUGHT CURRENT."
0140 PRINT :PRINT
0150 PRINT TAB(11);"IS THIS WHAT YOU WANT, [ Y ] OR [ N ]";
0160 INPUT X$
0930 INPUT X$
0940 IF X$<>"Y" THEN GOTO 180
0950 CHAIN UPINDIV.BAS, 10: END
0960 LET X$=""
0970 PRINT TAB(50);"ALTER=";:INPUT X$
0980 RETURN
0990 LET D1=Y7:D2=Y8:D3=Y9
1000 RETURN
1010 REM ALTER/CORRECT MARRIAGE FILES
1020 OPEN #2, MARR
1030 OPEN #5, NEW.MAR
1040 SCRATCH #5
1050 PRINT
1060 INPUT "NAME OF INDIVIDUAL: ",C$
1070 IF C$="" THEN CLOSE #2, #5:GOTO 1620
1080 IF C$="STOP" THEN CLOSE #2, #5:GOTO 1620
1090 READ #2, N$, G, A
1100 READ #2, D1, D2, D3
1110 READ #2, I, C, S$
1120 READ #2, W$, R$, T$
1130 IF C$=N$ THEN J2=1:GOTO 1200
1140 IF EOF(2)=1 THEN GOTO 1430
1150 WRITE #5, N$, G, A
1160 WRITE #5, D1, D2, D3
1170 WRITE #5, I, C, S$
1180 WRITE #5, W$, R$, T$
1190 GOTO 1090
1200 REM MARRIAGE ENTRY LOCATED
1210 GOSUB 1650:PRINT:PRINT
1220 PRINT TAB(10);"RESPOND WITH [ Y ] IF ITEM IS TO BE ALTERED"
1230 PRINT :PRINT
1240 PRINT "NAME: ";N$;:GOSUB 1570
1250 IF X$="Y" THEN INPUT "ALTERED NAME:",N$
1260 IF X$="Y" THEN GOSUB 1600
1270 PRINT "MARRIAGE NUMBER: ";I;:GOSUB 1570
1280 IF X$="Y" THEN INPUT "CORRECT MARRIAGE NUMBER:",I
1290 IF X$="Y" THEN GOSUB 1600
1300 PRINT "SPOUSE: ";W$;:GOSUB 1570
1310 IF X$="Y" THEN INPUT "NEW SPOUSE:",W$
1320 IF X$="Y" THEN GOSUB 1600
1330 PRINT "MARRIAGE DATE: ";R$;:GOSUB 1570
1340 IF X$="Y" THEN INPUT "CORRECT DATE:",B$
1350 IF X$="Y" THEN GOSUB 1600
1360 PRINT "MARRIAGE PLACE: ";T$;:GOSUB 1570
1370 IF X$="Y" THEN INPUT "CORRECTED MARRIAGE PLACE:",T$
1380 IF X$="Y" THEN GOSUB 1600
1390 PRINT "NUMBER OF CHILDREN: ";C;:GOSUB 1570
1400 IF X$="Y" THEN INPUT "CORRECT NUMBER OF CHILDREN:",C
1410 IF X$="Y" THEN GOSUB 1600
1420 GOTO 1150
1430 REM END OF FILE MANIPULATION
1440 CLOSE #2, #5
1450 KILL MARR.DAT
1460 RENAME NEW.MAR MARR.DAT
1470 IF J2<>1 THEN GOTO 1490
1480 GOTO 180
1490 REM MARRIAGE NOT FOUND
1500 GOSUB 1650:PRINT:PRINT
1510 PRINT TAB(10);"THE NAME, ";C$;","
1520 PRINT TAB(10);"DOES NOT APPEAR IN THE MARRIAGE FILES."
1530 PRINT TAB(10);"DO YOU WISH TO ENTER THIS INDIVIDUAL";
1540 INPUT X$
1550 IF X$<>"Y" THEN GOTO 180
1560 CHAIN UPMARRG.BAS, 10: END
1570 LET X$=""
1580 PRINT TAB(50);"ALTER=";:INPUT X$
1590 RETURN
1600 LET D1=Y7:D2=Y8:D3=Y9
1610 RETURN
1620 REM CONCLUDE PROGRAM
1630 CHAIN MAIN, 180
1640 END
1650 REM ROUTINE TO CLEAR CRT
1660 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
1670 RETURN
```

```
0170 IF X$<>"Y" THEN CHAIN MAIN, 180: END
0180  J2=0:GOSUB 1650:PRINT:PRINT
0190 PRINT TAB(5);"PLEASE SELECT WHICH FILES TO CORRECT:"
0200 PRINT
0210 PRINT TAB(7);"INDIVIDUAL FILES.....[ 1 ]"
0220 PRINT TAB(7);"MARRIAGE FILES.....[ 2 ]"
0230 PRINT TAB(7);"CONCLUDE SEQUENCE.....[ 3 ]"
0240 PRINT
0250 PRINT TAB(13);"PLEASE SELECT: ";:INPUT X
0260 GOSUB 1650
0270 ON X GOTO 290, 1010, 1620
0280 GOTO 180
0290 REM ALTER/CORRECT INDIVIDUAL FILES
0300 OPEN #1, INDIV
0310 PEN #4, NEW.INV
0320 SCRATCH #4
0330 PRINT
0340 INPUT "NAME OF INDIVIDUAL: ",C$
0350 IF C$="" THEN CLOSE #1, #4:GOTO 1620
0360 IF C$="STOP" THEN CLOSE #1, #4:GOTO 1620
0370 READ #1, G, A, M, C
0380 READ #1, D1, D2, D3
0390 READ #1, N$, S$, B$
0400 READ #1, P$, F$, M$
0410 READ #1, D$, E$, W$
0420 IF C$=N$ THEN J2=1:GOTO 500
0430 IF EOF(1)=1 THEN GOTO 820
0440 WRITE #4, G, A, M, C
0450 WRITE #4, D1, D2, D3
0460 WRITE #4, N$, S$, B$
0470 WRITE #4, P$, F$, M$
0480 WRITE #4, D$, E$, W$
0490 GOTO 370
0500 REM INDIVIDUAL ENTRY LOCATED
0510 GOSUB 1650:PRINT:PRINT
0520 PRINT TAB(10);"RESPOND WITH [ Y ] IF ITEM IS TO BE ALTERED"
0530 PRINT :PRINT
0540 PRINT "NAME: ";N$;:GOSUB 960
0550 IF X$="Y" THEN INPUT "ALTERED NAME:",N$
0560 IF X$="Y" THEN GOSUB 990
0570 PRINT "SEX: ";S$;:GOSUB 960
0580 IF X$="Y" THEN INPUT "SEX:",S$
0590 IF X$="Y" THEN GOSUB 990
0600 PRINT "BIRTHDATE: ";B$;:GOSUB 960
0610 IF X$="Y" THEN INPUT "BIRTHDATE:",B$
0620 IF X$="Y" THEN GOSUB 990
0630 PRINT "BIRTHPLACE: ";P$;:GOSUB 960
0640 IF X$="Y" THEN INPUT "BIRTHPLACE:",P$
0650 IF X$="Y" THEN GOSUB 990
0660 PRINT "FATHER: ";F$;:GOSUB 960
0670 IF X$="Y" THEN INPUT "FATHER:",F$
0680 IF X$="Y" THEN GOSUB 990
0690 PRINT "MOTHER: ";M$;:GOSUB 960
0700 IF X$="Y" THEN INPUT "MOTHER:",M$
0710 IF X$="Y" THEN GOSUB 990
0720 PRINT "FIRST SPOUSE: ";W$;:GOSUB 960
0730 IF X$="Y" THEN INPUT "FIRST SPOUSE:",W$
0740 IF X$="Y" THEN GOSUB 990
0750 PRINT "NUMBER OF MARRIAGES: ";M;:GOSUB 960
0760 IF X$="Y" THEN INPUT "NEW NO. OF MARRIAGES:",M
0770 IF X$="Y" THEN GOSUB 990
0780 PRINT "NUMBER OF CHILDREN, 1ST MARRIAGE: ";C;:GOSUB 960
0790 IF X$="Y" THEN INPUT "NEW NO. OF CHILDRE, 1ST MARRIAGE:",C
0800 IF X$="Y" THEN GOSUB 990
0810 GOTO 440
0820 REM END OF FILE MANIPULATION
0830 CLOSE #1, #4
0840 KILL INDIV.DAT
0850 RENAME NEW.INV INDIV.DAT
0860 IF J2<>1 THEN GOTO 880
0870 GOTO 180
0880 REM INDIVIUDAL NOT FOUND ROUTINE
0890 GOSUB 1650:PRINT:PRINT
0900 PRINT TAB(10);"THE NAME, ";C$;","
0910 PRINT TAB(10);"DOES NOT APPEAR IN THE INDIVIDUAL FILES."
0920 PRINT TAB(10);"DO YOU WISH TO ENTER THIS INDIVIDUAL";
1680 REM DATE ROUTINE
1690 PRINT :PRINT
1700 INPUT "ENTER DATE AS MM,DD,YY ",Z7,Z8,Z9
1710 PRINT :PRINT
1720 POKE( D9,Z7):POKE(D9+1,Z8):POKE(D9+2,Z9)
1730 GOSUB 1750:GOSUB 1650
1740 RETURN
1750 REM ROUTINE TO RECOVER DATE
1760 LET Y7=PEEK(D9):Y8=PEEK(D9+1):Y9=PEEK(D9+2)
1770 RETURN
```

PROGRAM LISTING 11

```
J010 REM ALTCH.BAS
0020 LINE= 120:J=0:L1=0:D9=28814:GOSUB 1000
0030 PRINT :PRINT
0040 PRINT TAB(16);"CHILDREN'S FILES ALTERATION"
0050 PRINT :PRINT
0060 PRINT TAB(9);"HAVE YOU SET TODAY'S DATE, [ Y ] OR [ N ]";
0070 INPUT X$
0080 IF X$="N" THEN GOSUB 1030
0090 IF X$="Y" THEN GOSUB 1100
0100 GOSUB 1000:PRINT:PRINT
0110 PRINT TAB(10);"THIS PROGRAM WILL CORRECT INPUT ERRORS IN"
0120 PRINT TAB(10);"THE CHILDREN'S DISK FILES OR ALLOW INFOR-"
0130 PRINT TAB(10);"MATION TO BE BROUGHT CURRENT."
0140 PRINT :PRINT
0150 PRINT TAB(11);"IS THIS WHAT YOU WANT, [ Y ] OR [ N ]";
0160 INPUT X$
0170 IF X$<>"Y" THEN CHAIN MAIN, 180: END
0180 GOSUB 1000:PRINT:PRINT:J2=0
0190 OPEN #3, CHILDREN.DAT
0200 OPEN #5, NEW.CHI
0210 SCRATCH #5
0220 INPUT "NAME OF INDIVIDUAL: ",C$
0230 IF C$="" THEN CLOSE #3, #5:GOTO 970
0240 IF C$="STOP" THEN CLOSE #3, #5:GOTO 970
0250 READ #3, N$, W$, I, C
0260 READ #3, D1, D2, D3
0270 READ #3, J, M$, O$
0280 READ #3, A1, P$, Q$
0290 READ #3, U$, V$
0300 IF C$=N$ THEN J2=1:GOTO 380
0310 IF EOF(3)=1 THEN GOTO 740
0320 WRITE #5, N$, W$, I, C
0330 WRITE #5, D1, D2, D3
0340 WRITE #5, J, M$, O$
0350 WRITE #5, A1, P$, Q$
0360 WRITE #5, U$, V$
0370 GOTO 250
0380 REM PARENT'S ENTRY
0390 GOSUB 1000:PRINT:PRINT
0400 LET L1=L1+1
0410 IF L1<>C THEN GOTO 430
0420 IF L1=C THEN GOTO 380
0430 PRINT TAB(10);"INDIVIDUAL: ";N$
0440 PRINT TAB(10);"SPOUSE: ";W$
0450 PRINT
0460 PRINT TAB(10);"MARRIAGE NUMBER: ";I;:TAB(22);"CHILDREN: ";C
0470 PRINT :PRINT
0480 PRINT TAB(3);"CHILD NUMBER: ";J
0490 PRINT "CHILD'S NAME: ";M$;:GOSUB 920
0500 IF X$="Y" THEN INPUT "CORRECT NAME:",M$
0510 IF X$="Y" THEN GOSUB 950
0520 PRINT "CHILD'S SEX: ";O$;:GOSUB 920
0530 IF X$="Y" THEN INPUT "SEX:",O$
0540 IF X$="Y" THEN GOSUB 950
0550 IF A1=0 THEN PRINT "CHILD IS NOT A DIRECT ANCESTOR";:GOSUB 920
0560 IF X$="Y" THEN A1=10
0570 IF X$="Y" THEN GOSUB 950:GOTO 610
0580 IF A1=10 THEN PRINT"CHILD IS A DIRECT ANCESTOR";:GOSUB 920
0590 IF X$="Y" THEN A1=1
0600 IF X$="Y" THEN GOSUB 950
0610 PRINT "CHILD'S BIRTHDATE: ";P$;:GOSUB 920
0620 IF X$="Y" THEN INPUT "BIRTHDATE:",P$
```

```
0630 IF X$="Y" THEN GOSUB 950
0640 PRINT "CHILD'S BIRTHPLACE: ";Q$;:GOSUB 920
0650 IF X$="Y" THEN INPUT "BIRTHPLACE:",Q$
0660 IF X$="Y" THEN GOSUB 950
0670 PRINT "CHILD'S DEATH DATE: ";U$;:GOSUB 920
0680 IF X$="Y" THEN INPUT "DEATH DATE:",U$
0690 IF X$="Y" THEN GOSUB 950
0700 PRINT "CHILD'S 1ST SPOUSE: ";V$;:GOSUB 920
0710 IF X$="Y" THEN INPUT "FIRST SPOSE:",V$
0720 IF X$="Y" THEN GOSUB 950
0730 GOTO 320
0740 REM END OF FILE
0750 CLOSE #3, #5
0760 KILL CHILDREN.DAT
0770 RENAME NEW.CHI CHILDREN.DAT
0780 IF J2<>1 THEN GOTO 830
0790 PRINT :PRINT
0800 INPUT "REPEAT THIS SEQUENCE, [ Y ] OR [ N ]",X$
0810 IF X$<>"Y" THEN CHAIN MAIN.BAS, 180: END
0820 GOTO 180
0830 REM ENTRY NOT FOUND
0840 GOSUB 1000:PRINT:PRINT
0850 PRINT TAB(10);"THE PARENT, ";N$;","
0860 PRINT TAB(10);"DOES NOT APPEAR IN THE CHILDREN'S"
0870 PRINT TAB(10);"FILES. DO YOU WISH TO ENTER THIS"
0880 PRINT TAB(10);"THIS INDIVIDUAL";
0890 INPUT X$
0900 IF X$<>"Y" THEN GOTO 180
0910 CHAIN UPCHILD.BAS, 10: END
0920 LET X$=""
0930 PRINT TAB(50);"ALTER=";:INPUT X$
0940 RETURN
0950 LET D1=Y7:D2=Y8:D3=Y9
0960 RETURN
0970 REM CONCLUDE
0980 CHAIN MAIN, 180
0990 END
1000 REM ROUTINE TO CLEAR SCREEN
1010 FOR X9=1TO3:PRINTCHR$(26):NEXTX9:PRINTCHR$(2)
1020 RETURN
1030 REM DATE ROUTINE
1040 PRINT :PRINT
1050 INPUT "ENTER DATE AS MM,DD,YY ",Z7,Z8,Z9
1060 PRINT :PRINT
1070 POKE( D9,Z7):POKE(D9+1,Z8):POKE(D9+2,Z9)
1080 GOSUB 1100:GOSUB 1000
1090 RETURN
1100 REM ROUTINE TO RECOVER DATE
1110 LET Y7=PEEK(D9):Y8=PEEK(D9+1):Y9=PEEK(D9+2)
1120 RETURN
```

1979 Index to INTERFACE AGE

Compiled by Jim Schreier, Associate Editor

Eclectic. That term describes the microcomputer information published in INTERFACE AGE during 1979. Anyone attempting to compile an index of such vast materials is aware of limitations. Like the inability to concordance all product, chip or subject references, for example. Instead, an effort was made to locate and index regular monthly columns as well as articles. Subject references from monthly columns is all in lower case. Article references use upper case for the first letter in the article's name.

The Index is presented in 14 divisions. Cross-indexing is used as necessary. Applications software not only identifies the program but type of source (BASIC, assembled, etc.) and respective dialect or chip.

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PHIDECK/DISK TRANSFER UTILITY. Runs under CP/M, CDOS or MCOS. Allows use of phidecks for backup of disk files, and more. Complete source listing included. $20.00 on 8" diskette. Send SASE for details. Greg Stuk, 2170-11 Cram Place, Ann Arbor, MI 48105, (313) 996-0497.

TRS-80 PERSONAL ESTATE planning program. Requires Level II and 16K. $19.95 for cassette and documentation. Larry H. Buss, 101 So. U St., Apt. 1, Lompoc, CA 93436. Add $4 for source listing.

MITS DISK DRIVE with BASIC & FORTRAN, $800. MITS Okidata 110 printer with controller, $800. SSM PROM with MITS DBL & MBL, $80. All boards fully socketed and factory checked out. Make offer. K.R. Roberts, 10560 Main St., Suite 515, Fairfax, VA, (703) 378-7266, 591-6008, 591-0277.

MITS Altair 8800A, includes 32K RAM, ACT, 2SIO, CPU, ADM-3A, manuals, ext. BASIC on cassette, etc. 5 months old. No troubleshooting, $1700 plus free tape recorder. First cashier's check or M.O. to M. Wedgle, 5228 S. Fox, #311, Littleton, CO 80120.

GODBOUT ECONORAM II boards (static 8K, 450 nsec, S-100 bus) plus 4 spare 2102 memory ICs, $90 each or nearest offer. Ron Subler, 25 First Parish Rd., Scituate, MA 02066.

S&D SALES 4K RAM, $50. Vector Graphic PROM/RAM, $75. Ten 1702A PROMs, $35. Fred Manthey, Box 619, Mullan, ID 83846.

TRS-80 DATA BASE/report generator. 32K & DOS. No user programming. Define file parameters & report format on-line. Report features: field select, filter, sort arith, summary. $49. Tony Pow, 96 Dothan St., Arlington, MA 02174.

TEXAS INSTRUMENTS TI-59 card programmable calculator with PC-100A printer. Aviation library, extra cards, programs and PPX materials. Almost new. Sent UPS. $287. Dave Balmer, Box 325, Union Lake, MI 48085.

IMSAI 8080 with 22-slot motherboard, Imsai MIO board, 8K Seals board, 16K Godbout board, active terminator board, extender/logic probe board, Polly VDM board, SDS 16K EPROM board. First certified check for $900 takes it. Software included. David Rosenblatt, P.O. Box 2600, Tampa, FL 33601.

SIKES RS-232 Comm-Stor with dual drives and most options. Perfect condition, $2500. Fred Bellomy, P.O. Box 2400, Santa Barbara, CA 93120, (805) 965-5555.

DIGITAL DEVELOPMENT CORPORATION Model 12750 fixed head disk. 196 Kbytes, 8.5 msec high speed access. Helium pressurized system with 16 external track protect switches. Full documentation. $500 plus shipping. J. Zeglinski, 32 Aldgate Ave., Toronto, Ontario, Canada M8Y 3L6.

WANTED TO purchase: two random beam CRT displays for use as vectored graphic displays. Must measure 12" or larger. Will pay top dollar for quality equipment. Send description and price to Edward Rees, 8835 S. Oak Park Dr., Apt. 20, Oak Creek, WI 53154.

WANTED: JOLT computer and Martin Research 8008-based computer. Can also use an Intel SIM-8 board. J. Titus, P.O. Box 242, Blacksburg, VA 24060, (703) 951-9030.

WANTED: CONTROL Data Corp. model 5A5/5A6 computer terminal, schematics and operatinos manual, or logic diagrams for 423 type logic rack. John Renwick, 1701 N. Fenmore, Camarillo, CA 93010.

WANTED: BACK issues of Interface Age, Byte, Kilobaud, Popular Electronics, Popular Mechanics, Radio Electronics and Scientific American in good condition. Have a few duplicates of above to sell or swap. Send details of holdings and price to Michael Carter, 62B Escondido Village, Stanford, CA 94305.

MICRODEX is a new classified advertising section available to readers wishing to buy, sell or trade hardware and software. Price is $1 per word, 25 word minimum. First two words printed bold. Additional bold type $5 per word. Send copy with check or money order to INTERFACE AGE, Dept. M-I, 16704 Marquardt Ave., Cerritos, CA 90701.

ADVERTISER INDEX

*Manufacturer requests factory-direct inquiry.

SOURCE
Continued from Page 87

to here, most felt that it was probably nice, but they couldn't see an immediate need or use for such a system. Some of these people had heard of computers. In fact, one was at the Radio Shack store to buy a TRS-80. Most had no interest in them at all.

Now, I realize that twenty people do not a survey make, but the input did prove to me that education is probably more important than the functions that are being offered on the Source.

WHAT IT CAN MEAN

The use of a time-sharing system such as the Source can mean a whole new era in citizen information dissemination. This type of system does not usher in 1984; but, in fact, makes the concept of Big Brother almost impossible to occur.

The reason for this is evident because communication, particularly mass communication, is the prime ingredient that keeps man free from the oppressions of big government. By developing better communication networks for the masses, average Americans can be apprised of what's happening instantly and, at the same time, inform their leaders of their feelings, just the opposite of the 1984 scenario.

The Source offers these capabilities and the others at a cost just about anyone can afford, see Table 1. The only possible long range difficulty that I can find with the system is the 30 characters per second transmission speed. This will probably change with time.

Currently, the system sends 80-character lines with a carriage return and linefeed at the end with one NULL. The system transmits 2K blocks or one 80x24 screen display at a time. However, in the several hours of operation that I and several other editors have used the system, we have noticed that an occasional bug does creep into the transmission and the 2K block is not always consistent.

System programmers at the Source have been advised of the problems and implemented corrections. Which brings up a significant point — the system is always in the state of continuous update. Data is constantly being enhanced, updated, and system problems cleaned up to make it even more useful to the user.

If you need the power of a large mainframe or can use the millions of bytes of data contained in the Source's database, then either go to your local computer store to see a demonstration and sign up, or call the Source at 1 (800) 336-3330 for more information.□

EDITOR'S NOTEBOOK
Continued from Page 13

things. However, the Corvallis division responsible for handheld calculators will probably introduce a personal computer aimed at the Apple market. Someone says it might be named Capricorn.

Should HP actually enter the market, and my guess is that if they do it will be at the winter CES, the whole picture will change dramatically in terms of pricing structure. I really suggest that you keep your eyes on Oregon.

GUESSES, SPECULATIONS AND PREDICTIONS

Dateline London, September, 1980

Gold selling for $600 per ounce. The American dollar, German mark, and Japanese yen take a nose dive.

Dateline Washington, September, 1980

Administration reports highest unemployment ever recorded since the depression.

Dateline Washington, September, 1980

Gasoline prices hit $1.60 per gallon. Department of Energy predicts over $2 per gallon by year's end.

Dateline Somewhere in Texas November, 1980

Major electronics firm introduces first 32-bit microprocessor.

Dateline Somewhere in Arizona November, 1980

Major electronics firm introduces first flat screen display.

Dateline Sometime in 80's

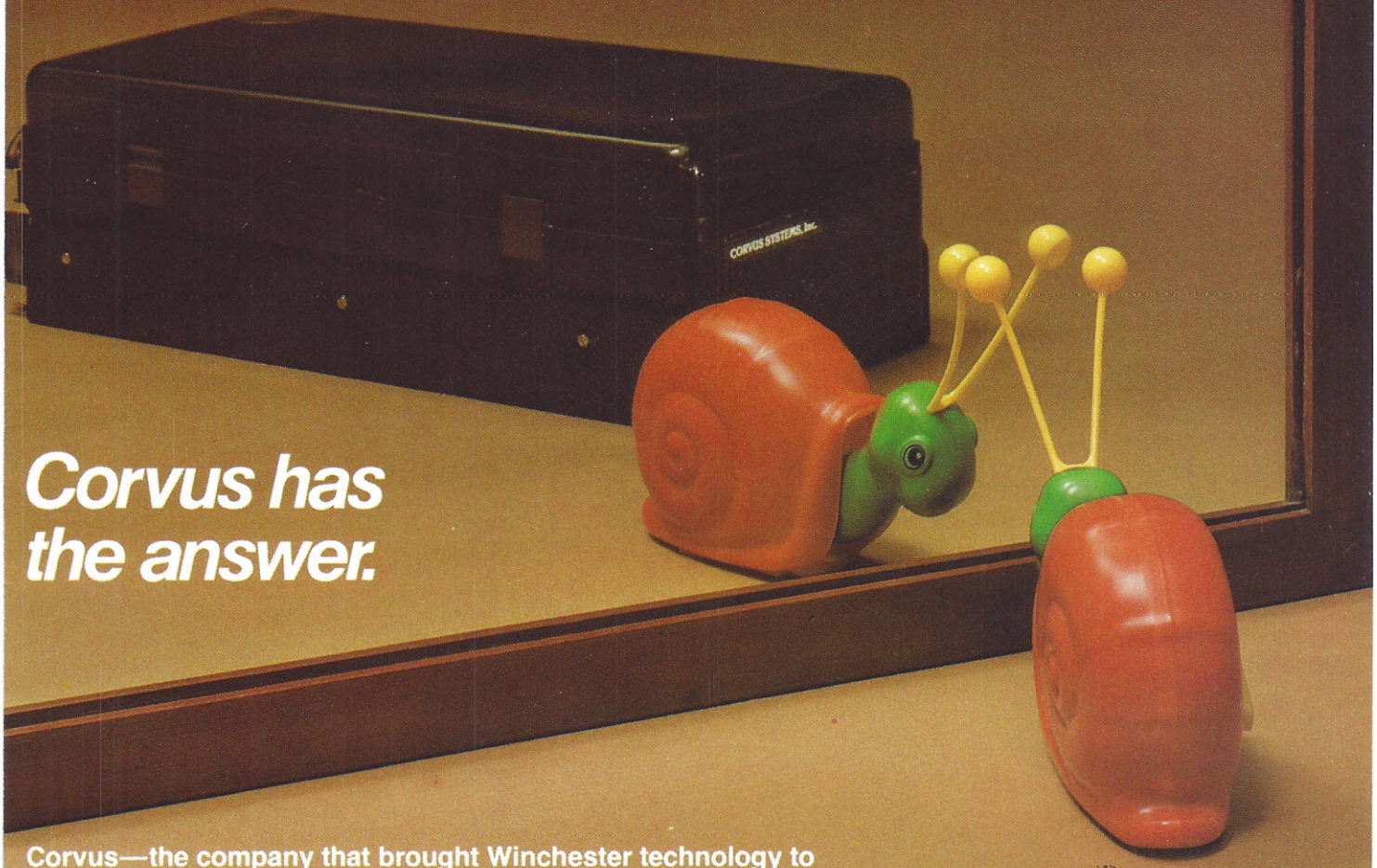
Major firm introduces a very specific type package that revolutionizes the small computer industry. Hate to be cryptic here. I know what this one is for sure and when it will be introduced. Trust me, it will be one that will in actuality create a subset to the computer industry.

Dateline Year-end 1980

Economy on major up-swing. A new magazine directed towards digital repairmen comes into being. Prices go down in all areas of the economy, less credit available, a new trend in the banking industry. A new energy coalition is formed with major funding from not only the U.S. government and industry, but with worldwide support.

—carl

CONCERNED ABOUT WINCHESTER BACKUP?



Corvus has the answer.

Corvus—the company that brought Winchester technology to the microcomputer—is now delivering the solution to backup for less than $1500.

It's called the Corvus MIRROR®, a backup employing low-cost removable media with a total capacity of up to 100 million bytes each. In approximately ten minutes, you can transfer an entire ten million byte disk without operator intervention.

Corvus is the company that gives you a complete systems solution to the mass storage needs of microcomputers. Our systems have fully compatible hardware and software for the Apple† (including Apple Pascal), S-100 Bus, TRS-80‡, and now the LSI-11 and ALTOS computers. We utilize proven Winchester technology with IMI-7710 drives. Up to four eight-inch disks can be used with our Z-80 based controller.

Interested in our new removable-media backup or our pace setting Winchester systems? Both are available now. Call or write for full information.

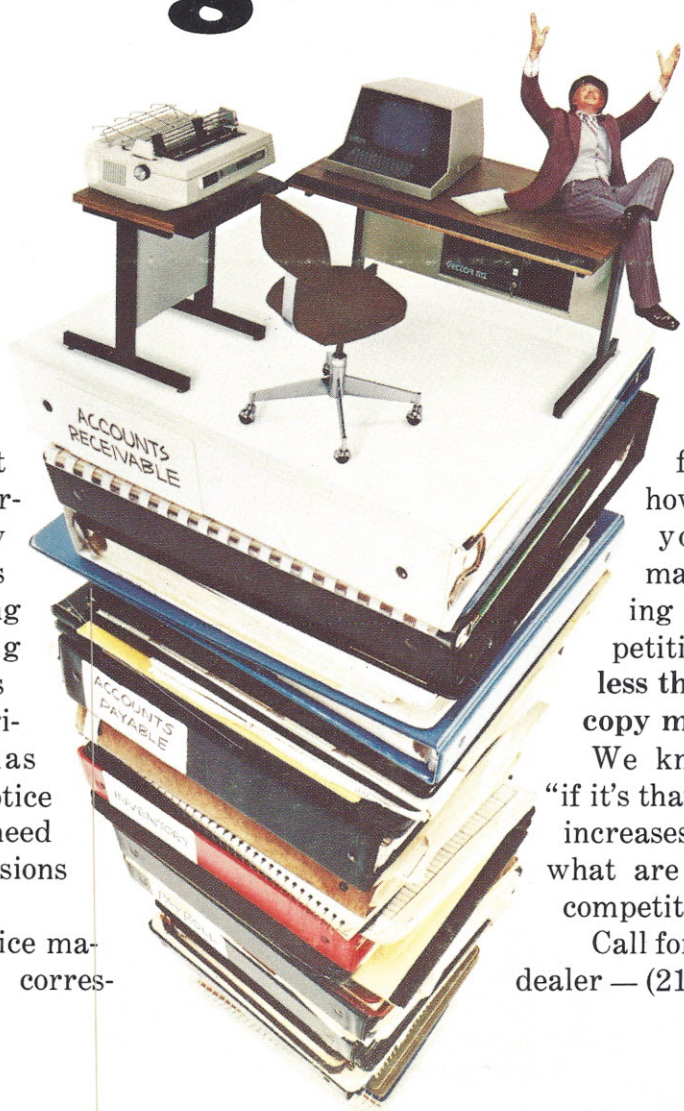
CORVUS SYSTEMS, Inc.

900 S. Winchester Boulevard
San Jose, California 95128
408/246-0461

†Apple is a registered trademark of Apple Computers, Inc.
‡TRS-80 is a registered trademark of Radio Shack, a Tandy Co.

CIRCLE INQUIRY NO. 13

A little Vector Graphic computer goes



Picture if you will, an office machine that relieves routine paperwork, speeds the flow of information, keeps up with your growing volume of accounting procedures, analyzes difficult sales or engineering data and has ready at a moment's notice any information you need for your business decisions — totally up-to-date.

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Call for your nearest authorized dealer — (213) 991-5740.

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